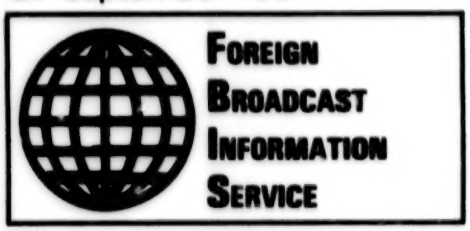
JPRS-UST-94-021
27 September 1994



JPRS Report

Science & Technology

Central Eurasia

Telecommunications Networks in Russia: Descriptions, Classifications, Selections

Science & Technology

Central Eurasia

Telecommunications Networks in Russia: Descriptions, Classifications, Selections

JPRS-UST-94-021 *27 September 1994*

CONTENTS

NOTE TO READERS: Effective 1 October, the processing indicators appearing in brackets at the start of each item will be changed. All new indicators will begin with "FBIS" to make the material more easily identifiable. Some will also indicate whether the item has been translated from the vernacular or transcribed from English.

Telecommunications Networks in Russia: Descriptions, Classifications, Selections

947K0106A Moscow TELEKOMMUNIKATSIONNYYE SETI ROSSII. OPISANIYE. KLASSIFIKATSIYA. VYBOR in Russian 1993 (singed to press 25 May 93) pp 3, 196-198, 59-160, 169-174

[Annotation, Table of Contents, Chapters 4-7, and Tables 8.5 and 8.6 of book TELEKOMMUNIKATSIONNYYE SETI ROSSII. OPISANIYE. KLASSIFIKATSIYA. VYBOR (Telecommunications Networks of Russia: Descriptions, Classifications, Selections) by Gleb Mikhaylovich Dmoshinskiy and Aleksey Vasilyevich Seryogin, 1993, Moscow, Arkhitektura i stroitelstvo Rossii, 5000 copies, 199 pages]

[Text]

Annotation

The book gives basic facts about the status of the market of telecommunications networks and information systems of Russia. The authors give a classification of networks by their technical-economic and operating characteristics. An examination is made of reference information and applied information systems designed for various purposes. Recommendations are given on procedures for selecting telecommunications networks that meet the requirements of potential users.

For a wide range of readers interested in questions of applied use of telecommunications networks and information systems for automating operations in management, commerce and science.

Table of Contents

Chapter 4: Data Transmission and Document Exchange Networks

4.1. "ARGONAUT" Network

The "ARGONAUT" Russian information and financial telecommunications network (RSIFT) [20] solves the problem of providing information support in the interests of socioeconomic development of Russia based on telecommunications services to:

- governmental and commercial banks and their accounting centers;
- governmental and local administrative and statistical accounting agencies;
- stock, raw material, commodity and other exchanges, trading establishments, insurance companies, tax inspectorates;
- enterprises and organizations with various kinds of property.

Communications Services. Among these are:

a. E-mail based on X.400 and X.500 protocols. In addition to service provided by these standards, the e-mail mode allows organization of teleconferencing, permanent advertising, and so on.

b. Express-mail: rapid (within two minutes) delivery of electronic messages.

c. Electronic document exchange, i.e. exchange of information between network subscribers and the owners of telegraph, fax and telex machines, in which software handles the necessary signal switching and conversion without user intervention.

d. Providing high-quality digital telephone communication on demand.

e. Guaranteed confidentiality with various categories of security of transmitted and received messages and documents. Providing identification and authorization of users, digital signatures.

f. Providing access to external domestic and foreign computer and telephone communications networks.

Information Services. Electronic fund transfer (EFT) realized by a subsystem of paperless document exchange. EFT allows processing of negotiable instruments (a set of prepared forms is provided with verification of filling them out) and tracking (on the PC display) of movement of the routed document to the addressee, verification of the validity of essential elements, and confirmation of delivery, conversion of the document to the form required by the addressee, and also provision of a certified electronic signature.

Electronic Commercial Services. The network is used for electronic trading, and storage of information about bids and commodities. Databases are searched for proposals that meet requirements of trading partners, and stock exchange information is offered on demand for interactions on various levels: client-broker, broker-exchange, exchange-exchange or interexchange center, access to foreign exchanges. Support is provided for deals between remote partners with ensuing receipt of legally certified confirming documentation.

Network Topology. To support the aforementioned functions and services, the RSIFT is configured as a distributed computer network that covers the entire territory of Russia and includes gateways to other Russian and foreign telecommunications networks.

The RSIFT includes:

- regional message processing and transmission centers (TsOPS) based on minicomputers of workstation class;
- a network control center (TsUS);
- routing control centers (TsUM);
- communication channels via satellite and ground bases.

The topology of the network is realized as a three-level hierarchical structure consisting of:

- a first-level subnetwork that interconnects 10 economic regions of the RF;
- a second-level subnetwork that interconnects the TsOPS of regions and first-level TsOPS;
- a third-level subnetwork that interconnects network subscribers in a region with first-level and second-level TsOPS.

The network interconnects 10 information regions with centers in Moscow, St. Petersburg, Voronezh, Nizhniy Novogorod, Samara, Rostov-na-Donu, Yekaterinburg, Novosibirsk, Irkutsk and Khabarovsk that can communicate on the "each-with-each" principle. A radial structure of connections is realized within regions.

Information Security. The RSIFT includes an information security system that enables:

- guaranteed security of information of any kind during predigitizing, storage in data banks, or data transmission through communication channels;
- protection by hardware and software with user-specified resistance;
- protection from unauthorized access both by outside individuals and by service personnel and Network users not authorized to access the given type of information;
- creation of an "electronic signature" that guarantees total fidelity and undistorted transmission of business documents;
- identification and authorization of Network users.

Provision is made for certification of equipment and facilities in competent governmental organizations with corresponding warranty during RSIFT service.

Rates. Expert evaluation of the average annual income for network services per user is 300,000 rubles. The average proposed fee for data transmission (since the end of 1992) is 10 rubles per kilobyte [20].

Status of Network Development and Evolution. Growth of the network to 5000 subscribers in 1993. Completion of network infrastructure—1995.

Characterization of Data Transmission Facilities. The satellite segment of communication channels is intended for organizing high-speed communication channels (with transmission rate of 64,000 bauds) between Network nodes. It is based on geostationary satellites of "Gorizont" type (in future to be "Ekspress" type) parked at 40 and 103 degrees e.long, and an "Argonaut" mobile satellite communications system (SCS).

The ground-based segment of the communication channels is intended for organizing communications (with transmission rate of 14,400 bauds) between regional TsOPS and Network users. These channels are also used for communications between Network nodes in the absence of satellite communication channels in regions. As a rule, Network subscribers are connected to the corresponding TsOPS over dedicated or switchable communication channels.

Interaction Protocols. In organizing the network, approved and most prevalent approaches were used, based on international protocols X.25, X.400 and TCP/IP. TCP/IP was selected as the base protocol on stages of Network development and expansion.

In the selected base protocol, the ideology of the architecture consists in creating a network that will be able to handle the anticipated load, but will permit loss or corruption of data packets on individual machines or connections without attempts to recover. Instead of this, a transport level is being constructed that detects and eliminates errors. Such independence of the level of network interface makes TCP/IP software simpler and more reliable.

In this context, intermediate gateways will cut out data packets that cannot be delivered because of distortions, or when the sending rate exceeds the processing rate. Subsequent detection of losses and recovery are then handled by the joint efforts of sender and receiver software, termed "end-to-end check." The final modules of the software that

produce the messages are concentrated on the transport level; they utilize checksums, confirmations and timeouts for transmission control.

Thus, as contrasted with the levels of X.25 that are oriented toward continuous connection, the safeguard of reliability in TCP/IP is concentrated on one level, which on the one hand enables transmission of data over unreliable communication channels between TsOPS and users, and on the other supports data transmission via the satellite segment of the RSIFT.

The base TsOPS computer software includes support of the DEC Company's proprietary network architecture DNA (Digital Networking Architecture) and the OSI standard of open network architecture.

Characteristics of Facilities.

a. Message processing and transmission centers (TsOPS) of the RSIFT are to perform the following functions:

- server of e-mail system;
- server of file transmission service;
- server of terminal access service;
- server of telefax service;
- server of telex service;
- X.25 gateway;
- accounting for RSIFT user traffic in region;
- control of communication channels;
- database organization and management.

The makeup of TsOPS facilities is determined by the number of users and the level of traffic in the region.

It is proposed that DECstation 5000/240 and DECstation 5100 workstations made by the DEC Company (United States) be used as the base computers of the message processing and transmission centers (TsOPS).

b. Routing and control centers.

The functions and makeup of routing and control centers (TsMUP) have certain differences when siting is in nodes of the first or second level of the RSIFT.

TsMUP's of the first level perform the following functions:

- routing and control of data streams;
- interfacing with channel forming equipment (KOA) of the "Argonaut" SCS;
- checking status and controlling operation of the SCS;
- switching satellite communication channels in mode of "offering channels on demand";
- interfacing digital channels with TFSOP's.

The main distinguishing feature of TsMUP's of the second level is absence of a routing module. This is because nodes of the second level are connected in a radial arrangement with the principal node of the first level, and accordingly do not realize the routing function and dynamic redistribution of streams.

c. Network control center ((TsUS).

The TsUS performs the following functions:

- data acquisition, analysis of the technical status of facilities and imaging the status of the network as a whole;
- controlling reconfiguration of the network for the purpose of restoring its operability and maneuvering resources;
- monitoring network loading;
- detecting and localizing failures, restoring operability of the network;
- statistical processing and accounting for traffic during certain time frames;
- determining cost of services, billing Network users, issuing receipts for payment;
- testing and measuring major characteristics of the Network, analyzing effectiveness of utilizing Network addresses;
- accumulating archives of Network performance;
- organizing reference data banks;
- supporting operation of the data security management system.

The base hardware of the TsUS is a DECstation 5100 computer. The TsUS is combined with the Network node of the Central region (Moscow) and is connected to it by switching facilities.

d. "Argonaut" satellite communication system.

The base of the satellite segment of the RSIFT is the "Argonaut" satellite communication ground station (SCGS) based on the experimental "Nauka-M" SCS.

The "Argonaut" SCGS is designed for:

- creating a set of 200 digital duplex satellite communication channels with transmission rate of 64,000 bauds via satellite relays of "Gorizont" type (parked in geostationary orbit at 40 and 103 deg. e.long.);
- providing the necessary throughput of network nodes of the first (capacity of 25 megabauds) and second (capacity of 14.4 Megabauds) levels;
- providing duplex digital telephony channels "on demand" (110 of the first level and 39 of the second level).

4.2. "BIZ LINK" Telecommunications Network

The "BIZ LINK" telecommunications network [1, 2] supports multilateral computer conferencing via existing telephone and computer networks.

The operating organization is the "Glavk Ltd." Center for Business Cooperation, official representative of BizLink Corporation (United States).

Communication Services. Data transmission, remote access to resources.

Information Services. Services offered by the "BIZ LINK" system are in the field of teleconferencing. All messages go to an electronic information bank, where they are automatically sorted in accordance with the topic of ongoing multilateral information exchanges.

Users who have subscribed to the "BIZ LINK" system have access to international scientific and commercial networks, to international teleconferencing systems, libraries of non-commercial software, and also to existing commercial information services on the territory of the former USSR.

Information exchange may be accomplished in modes of "plenary discussions" and "closed discussions." Users may form private telecommunications networks, including for payment. To do this, it suffices to copy the BizLink proprietary software and distribute it on diskettes to all proposed correspondents that have modem communication.

The system is convenient for maintaining communications of brokerage offices with central departments of stock exchanges, coordinating the activity of large agencies, industrial organizations, voluntary associations, and also for conducting international and national scientific conferences.

Since early 1992, "BIZ LINK" network has offered Russian users the capability of using BizLink Corporation's host computer at the company's headquarters in Colfax, North Carolina. The host computer is accessed through a temporary intermediary (Infocom Company) via its Moscow telephone.

Rates. The network charges the following fees for services [1]:

- registration of network address $50.00 U.S.;
- monthly charge: for commercial organizations $25.00 U.S.; for voluntary associations $10.00 U.S.;
- foreign exchange $20.00-$22.00 U.S. per hour.

Characteristics of Service Quality. In a session lasting one or two minutes on "BIZ LINK," a user has time not only for sending a message, but also for receiving an automatically formatted message packet.

4.3. "GLASNET" Computer Network

The GlasNet global information network [1, 2, 8] interconnects the following networks: PeaceNet and EcoNet (United States), GreenNet (England), AlterNex (Brazil), WEB (Canada), Pegasus (Austria), NordNaetet (Sweden), ComLink (Germany), Chasque (Uruguay), Nicarao (Nicaragua), and "GLASNET" (Russia). GlasNet is a member of the Association for Progressive Communications (APC, San Francisco), whose main purpose is to offer e-mail capabilities to a wide range of users for information exchange in the area of international security, defense of human rights, environmental protection, education, culture and other humanitarian areas.

The operating organization is the "GLASNET" Computer Network Users' Association.

Communication Services. E-mail, fax and telex communication. Data transmission protocol is X.25.

Information Services. Retrieval of information on topics of interest, electronic conferencing, posting of advertisements in "GLASNET" electronic conferences. "GLASNET" provides users with access to several hundred international teleconferences.

Network Topology. "GLASNET" provides direct-dialup e-mail access in Moscow, St. Petersburg, Vladivostok, Murmansk, Odessa and Riga.

Interfacing With Other Networks. "GLASNET" subscribers may exchange information with users of other networks that are part of APC, as well as with subscribers of many other networks through APC channels (about 50 networks in the United States); interfacing with the Russian "RELCOM" network is provided.

4.4. "IASNET"

The "IASNET" packet switching data network [1, 2, 17] provides document exchange and access to databases both in the CIS and in other nations. The network developer and operating organization is the All-Russian Scientific Research Institute of Applied Computer-Aided Systems (VNIIPAS).

Communication services. "IASNET" users are offered the following services:

- "IASNET Russian Express" e-mail, which allows posting a message on a bulletin board, interactive chatting, multiple mailing, access to e-mail users, and also the capability of owning mailing equipment, making an agreement for its delivery;
- "RELCOM" e-mail both within the former USSR and beyond its borders;
- file transmission, access and management service, providing the user with data transmission among network subscribers;
- virtual terminal service, supporting connection of different types of equipment to the network;
- reference-information service, providing users with various kinds of information about network resources and capabilities.

Information Services. Among those offered by "IASNET" are:

- smart-interface database access providing preparation for search and automatic data retrieval in the mode of remote access to databases both in Russia and beyond its borders;
- computer teleconferencing service, offering users wide capabilities for formation, search and retrieval of subject-oriented information; providing synchronous and asynchronous interactive communication between two or more users.

Method of Forming Secondary Network. Switchable or dedicated lines of the OGSTFS (State-Wide Automated Telephone System) on subscriber sections of the network; dedicated network channels on trunk sections.

Territorial Siting of Network Facilities. Network nodes are located in Novosibirsk, Dushanbe, Rostov, Tbilisi, Yerevan, Odessa and Obninsk. Network services are used by

subscribers in more than 20 cities of Russia, more than 15 cities in nations of the former USSR, and in 11 foreign countries.

Interfacing With Other Networks. "IASNET" interacts with networks of foreign countries in accordance with X.75 procedures. This is done through dedicated communication channels (9600 bauds) to data network nodes in foreign countries: DATAPAK (Finland), RADAUS DATA (Austria), BULPAK (Bulgaria), and via Intelsat to the U.S. network TRT/FTS SMT USA.

Charges. "IASNET" uses a developed system of rates for services paid in rubles and freely convertible currency [1]:

a. "Russian Express" e-mail services:

- registration charge 500 rubles;
- monthly service charge 50 rubles;
- connect time 30 copecks/minute;
- storage 20 copecks/kilobyte/day;
- data transmission 40 copecks/kilobyte;

b. "RELCOM" e-mail services:

- signup 3000 rubles;
- data transmission in Russia 1 ruble/kilobyte;
- data transmission outside of Russia 7 rubles/kilobyte;

c. Telecommunications access to automated databases (ADB) over dedicated communication channels:

- registration charge 9500 rubles;
- X.25 connection service 3500 rubles/month;
- asynchronous connection service 3500 rubles/month;
- automatic callup of resource 50 rubles/month;
- closed user group 50 rubles/month;

d. Telecommunications access to ADBs over switchable communication channels:

- registration charge 500 rubles;
- user service charge 200 rubles/month;
- automatic callup of resource 50 rubles/month;
- closed user group 50 rubles/month;
- connect time for traffic inside "IASNET" 20 rubles/hr; 1.5 rubles/20K (1 block);

e. Foreign traffic:

- Europe: $6.00 U.S. per block;
- United States: $16.00 U.S. per block;
- Japan: $8.00 U.S. per block;
- South America: $18.00 U.S. per hour; $18.00 U.S. per block;

f. Access to SFMT e-mail (SOVAM TELEPORT) 0.97 rubles/minute;

g. Information service by ADB access 192 rubles per search;

h. CD database access:

- signup 3000 rubles/year;
- access 120 rubles/hr;

i. Foreign ADB access:

- per search from $5.00 to $50.00 U.S.;
- access from $50.00 to $500.00 U.S. per hour.

Interaction Protocols. "IASNET" uses the protocol profile (Profile I) recommended by the CCITT (X.25, X.3, X.28, X.29, X.75) for packet switching networks.

For access to foreign data networks, as well as for connecting foreign users to VNIIPAS resources, special internetwork gateways are used: INTROKOM systems.

Characteristics of Facilities. "IASNET" is realized on the basis of equipment of the following types:

- computer systems or subscriber computers for processing and/or storing information that is accessible to a wide range of network users;
- user terminal equipment—PCs, LANs, various kinds of terminal devices;
- terminal data concentrators or packet adapters (PA) that interface various kinds of equipment to the data network;
- protocol matching and conversion units—gateways that connect different kinds of computer systems to the network, and when necessary convert data exchange protocols;
- internetwork communication units that support interaction of the network with other domestic and foreign networks;
- units for network control and operation.

The computer systems and terminal equipment used in "IASNET" may be large and small computers (of type YeS and SM), various PCs and any other terminal equipment having the S2 (V.24) interface. The network uses two types of packet switching centers (PSC): for 4 and 8 synchronous channels. The maximum throughput of a PSC is 100 packets/second, assuming an average packet length of 64 bytes.

Status and Trends of Network Development. "IASNET" subscribers are situated in states of the former USSR, former CEMA nations and in other foreign countries. In 1990, network users in these three categories numbered 123, 24 and 143 users respectively. At the present time, work is being done on improving and expanding the network (on the part of the number of users and services offered). Packet switching system equipment has been purchased from A11 Katel: type DPS2500 (PSC of type PSX1, PA of type ACX, and network control center of type NMC-duplex). The packet switching centers have capacity from 350 to 2400 packets/second; the number of connectable ports is up to 384. Data transmission rate in trunk channels is as high as 512,000 bauds [92].

4.5. "INTERLINK" E-Mail Network

"INTERLINK" [1, 2] is an e-mail network.

Operating organization: "Interlink" Russian-German joint enterprise.

The founder on the German side is PROFIN GmbH, and on the Russian side—NPO TsKB Minsvyazi (Scientific Production Association "Central Design Office of the Ministry of Communications").

On the German side, a direct partner in "Interlink" in the area of offering telecommunications services is GTCC (Gesellschaft TeleCommunication Consulting GmbH).

The base organization of the network in Germany is GTC (Gutachter TeleCommunication), developer of the network hardware-software package and holder of patent rights to the software and hardware.

"Interlink" is the base organization of the "INTERLINK-GTC" network in the former USSR, and in direct cooperation with GTC is the codeveloper and author of the version of e-mail system software localized in this country.

"INTERLINK-GTC" is constructed in accordance with a regional principle. At the present time, the network is made up of 10 nodes located in Luxembourg, Switzerland and Russia. Each node is supported by independent companies or firms that make up the "INTERLINK-GTC" e-mail network.

Communications Services. The following kinds of services are provided in the "INTERLINK" network:

a. E-mail. Mail is delivered both within "INTERLINK-GTC" network and to other e-mail systems such as the Internet.

Mail delivery time within the system to any network node is not more than 20 minutes.

Additional services provided:

- stopping delivery of messages within the confines of one network node;
- delivery at a specified time;
- rereading at a specified time;
- notification of receipt of correspondence;
- reply to the return address;
- XMODEM and ZMODEM file transfer protocols.

b. Delivery of fax messages. Fax messages are delivered from the "INTERLINK-GTC" system. Text files sent from any network node are transmitted by a distributed system of fax servers to any telephone number (to a connected fax machine).

There are three fax servers in the network:

- in Stuttgart for transmitting fax messages to Germany;
- in Moscow for transmitting fax messages within the former USSR;
- in Luxembourg for transmitting fax messages to any telephone number in other countries.

c. Delivery of telex messages. Telex messages may be transmitted and received directly in a personal electronic mailbox. For this purpose, each user is assigned an individual telex number served by the telex server installed in Luxembourg.

Information Services. Network nodes maintain a large number of bulletin boards that are filled with information by subscription from various sources (topics: software, computer equipment, finance, business notices, and so on).

The "INTERLINK-GTC" network offers several on-line services:

- access to videotex systems in Germany and France;
- access to numerous databases;
- X.25 network access via the Datex-P German national network.

"INTERLINK-GTC" subscribes to several dozen databases (chiefly in Germany).

"INTERLINK-GTC" offers access to the Datex-P packet switching network for those who want to work on-line with other computer systems connected to regional X.25 networks.

Direct on-line user interaction can be organized in the chat mode or in conferencing for correspondents from different networks.

Mention should be made of an important feature of the "INTERLINK-GTC" system: polyglotism. The user interface (menus, help facility) is in four languages: Russian, German, English and French.

Within the system, correspondence can also be delivered to any node in any of these four languages.

Rates. The following charges are specified in [1] for services of the "INTERLINK-GTC" system:

- signup fee 500 DM;
- monthly service charge 90 DM;
- each minute of connect time 0.60 DM;
- mail services (per message, 1 kilobyte): within the GTC network 0.30 DM; within a local network 0.10 DM; for relay through the X.400 Internet gateway 0.40 DM; for reception via the X.400 Internet gateway 0.10 DM;
- on-line communications via X.25 Datex-P network in Europe: per minute of connect time 0.40 DM; reception (transmission) of one kilobyte of data 0.65 DM.

4.5. "INFONET"

The "INFONET" information network [1, 2] offers services to support computer communication with subscribers in 120 world nations. Participating in "INFONET" are virtual networks: sections of a global network dedicated to the exclusive use of one or more subscribers and closed to unauthorized access.

The operating organization is the Russian-Finnish joint enterprise "Infokom."

Communications Services. "INFONET" users are offered services in:

- e-mail;
- fax information transmission;

- telex information transmission;
- X.25 and X.400 network access;
- use of international telephone communications.

Information Services. Organization of electronic conferencing is supported.

Network Topology. The stockholders of the "INFONET" Company are MCI (United States) and ten governmental postal and telecommunications administrations of Western European countries, Australia, Singapore and Japan. Three regional centers and 40 local support stations have been set up on the territory of these nations.

Rates. Charges for services in "INFONET" are as follows [1]:

- signup fee 450 DM;
- monthly service charge 50 DM;
- transmission of fax page: to Europe 3 DM; to the United States 4.5 DM; to Australia 5.5 DM.

The cost of working in the system depends on connect time and on the volume of information transmitted. Payment may be made in rubles at the current exchange rate.

4.7. "INFOTEL" Data Network

"INFOTEL" [1, 2, 18] is a packet switching data network that meets data transmission standards (in particular X.25). The network is based on the latest telecommunications equipment. The hardware basis of "INFOTEL" is EWSP equipment made by Siemens (Germany). Information is exchanged by virtual calls in the "INFOTEL" network.

The operating organization is the "INFOTEL" Small Business set up by an international center for informatics and electronics and the "Moscow Municipal Telephone Network" Production Association.

Communications Services. "INFOTEL" offers users the following basic data transmission services:

- data transmission (text files, spreadsheets, graphics files, electronic documents, software and other kinds of information;
- transmission and reception of telex messages;
- on-line access to remote information and computer resources.

E-mail servers are to be installed in future. The e-mail system will support the following services:

- message processing in accordance with CCITT recommendations X.400;
- use of directories in accordance with CCITT recommendations X.500;
- message exchange between e-mail and telex service users;
- message output to fax machines.

Method of Forming Secondary Network. Switchable channels of the OGSTFS (State-Wide Automated Telephone System); dedicated (leased) channels of the primary State network

Network Topology. It is proposed that the network be deployed by stages. On the first stage (second quarter of 1992), a section of "INFOTEL" in Moscow is put into service. Connection to Datex-P (Germany) via satellite in June-July 1992.

On the second stage (1992), the network is expanded to 15 cities of Russia and the CIS, and on the third stage (1993-1995) to 25 cities of Russia.

Information Security. "INFOTEL" provides high fidelity of transmitted information and protection by using reliable transmission mechanisms, user ID and setting up closed user groups.

Interfacing With Other Networks. In 1992, the starting section of "INFOTEL" is connected to Datex-P (Germany) via satellite.

On the first stage, the Intelsat system will be used to connect "INFOTEL" to the Datex-P network. The satellite channel will have a baud rate of 9600 on the first stage. "INFOTEL" is connected to Datex-P through an X.75 interface.

In accordance with a preliminary agreement, this connection will be made in Germany by using a satellite communications station in Dusseldorf, where the Datex-P network center is located.

Rates. The rate structure of "INFOTEL" is given in [1, 8]:

- one-time user connect charge;
- rental for dedicated communication channel to the nearest packet switching center (when connected to a dedicated channel);
- monthly charge for use of network services;
- charge for connect time and volume of transmitted data.

Characterization of Data Transmission Facilities. Packet switching nodes are connected by dedicated channels with baud rate of 9,600-64,000. Data transmission rate on subscriber sections is 1,200-64,000 bauds.

Subscriber access is via dedicated digital AF channels and by direct cable, and also by switchable channels of the "ISKRA-2" telephone network and a telex network.

Interaction Protocols. "INFOTEL" implements international standards and recommendations for carrier data networks: X.25, X.75, X.3, X.28, X.29.

Characteristics of Facilities. The hardware basis of "INFOTEL" is EWSP equipment made by Siemens (Germany):

- packet switching center (PSC) combined with network control center HNN/HMS and supporting connection of subscribers through dedicated and switchable communication channels with the use of 210 ports;
- HNN-20 packet switching centers with 20 ports each;
- modems for operation over dedicated and switchable communication channels.

The capacity of the HNN-20 PSC is 200 packets/second, and of the HNN PSC—1500 packets/second.

The network control center (HMS) combined with HNN is used for implementing functions of controlling network operation, gathering and processing statistics about network performance, planning network use, and so on. The Siemens network control system is organized by using special control modules and corresponding peripheral equipment in the switching centers.

EWSP hardware and software facilities have been developed to meet high reliability requirements. HNN/HMS is backed up on the level of modules, processors and controllers. In a normal situation, the aforementioned components can operate with components of the same type in load-sharing mode, and when there are failures, they can handle the load coming in from failed components.

4.8. "ISTOK-K" Network

The "ISTOK-K" commercial automated network for data transmission and document exchange [1, 2, 16, 88] is based on the "ISTOK" branch network. The chief developer is "Masshtab" Scientific Production Complex in St. Petersburg; the operating organization is the "BAKOM" partnership.

The "ISTOK-K" network is an aggregate of packet switching and message centers connected by standard channels of the State communications network. The network integrates transmission of three kinds of information: telegraph, fax and data.

Communications Services. The "ISTOK-K" network offers users the following services:

- message exchange in e-mail mode; this mode of operation permits exchange of information with intermediate storage in the network;
- message delivery to all network subscribers, including temporarily non-working subscribers (in a state of emergency, working by shifts or in different time zones); the network provides storage of messages addressed to disconnected subscribers for six days;
- organizing of chatting and exchange of messages of two subscribers in "query-reply" mode, including interaction between users and computers;
- transmission of large blocks of information—files; the network supports message exchange with maximum length of 30,000 characters;
- transmission of data, telegraph and fax information;
- message copying (transmission of multiple-address messages in accordance with a predetermined listing and circular messages to all addresses), giving the user the capability of uploading one message and sending it to several addresses;
- priority messaging service by categories of urgency; the network has three categories of urgency;
- message delivery to subscribers working in different time zones, registration and time-indexing information transmitted over the network;
- data exchange between remote computer systems;
- operation with different codes of data representation depending on type of subscriber equipment;
- organization of closed groups (subnetworks) of users who can exchange data only among themselves; a privileged group of subscribers may be organized with the right of data exchange with any network subscribers.

Method of Organizing Secondary Network. On subscriber sections—dedicated (leased) or switchable lines or channels of the State telephone (telegraph) network; on trunk sections—only dedicated channels of the primary State network.

Network Topology. At the present time, switching centers and concentrators of the network are located in 12 cities of Russia and CIS nations.

Information Security. The "ISTOK-K" network guarantees reliable and timely transmission of data both in generally accessible form and secure from unauthorized access. The network of data transmission and document exchange is protected from premeditated action of the operators of subscriber stations and service personnel of packet switching nodes on its performance and the possibility of damage. This is accomplished by appropriate algorithmic and program software and by organizational and technical measures.

The principal methods of protection are user ID (verification of right of access to the network), security against attempts to access a closed user group, verification of the rights of a user to certain operations.

Interfacing With Other Networks. The network supports interaction with public telephone and telegraph networks. Interfacing with the "TRANSPAK" network is to be organized.

Rates. The "ISTOK-K" network charges for the following services [88]:

- delivery of equipment, software, and hookup depending on the modification (without PC and fax machine) from 50,000 to 300,000 rubles;
- leasing dedicated telegraph or telephone communication channel from subscriber to switching node of network—in accordance with prices of the Ministry of Communications;
- data transmission in "ISTOK-K" network: subscriber charge 50-150 rubles per day; actual cost for transmitted information with allowance for network services if it exceeds subscriber charge—in accordance with connect time charges for "ISTOK-K" network services.

Characteristics of Service Quality. Average time of message delivery: 90 s for the first category of urgency; 15 minutes for the second category; 60 minutes for the third category. Probability of reception with error detection in through channel (except for telegraph information) not more than 10^{-6}. Probability of loss of message not more than 10^{-9}. Probability of sending to the wrong address not more than

10^{-9}. System capacity 500,000 messages per day (for an average message length of 200 characters).

Terminal Equipment of Network. "ISTOK-K" users are offered the capability of using subscriber stations of the following types:

- AP-N low-speed subscriber station for operation over dedicated telegraph channels at 200 bauds;
- AP-S medium-speed subscriber station for operation over AF channels at 1200-4800 bauds;
- multiterminal shared-use subscriber station supporting simultaneous transmission and reception for 8 or 16 users.

All subscriber stations are based on PCs compatible with the IBM PC XT/AT, YeS-1841, YeS-1845.

The subscriber terminals of the "ISTOK-K" network may be:

- standard telegraph units ATA-50, RTA-80, RTA-7M or F-2000;
- SM or YeS computers;
- fax machines;
- LANs.

Status and Outlook for Development of the Network. the "ISTOK-K" commercial network is based on the "ISTOK" branch data network that has already been in use for 7 years. At the present time, network services are being used by 2500 subscribers of businesses, defense and national security services. Now any business or private individual can become a subscriber of the "ISTOK-K" network on a commercial basis. Subscribers are connected to the network within one or two months depending on the complexity of organizing the channel between the subscriber and the nearest access to the network.

Characteristics of Data Transmission Facilities. The "ISTOK-K" network operates over channels of various types: cable, radio and radio-relay, satellite. The trunk section of the network is constructed entirely on dedicated channels. Local subscribers may use dedicated telephone or telegraph channels, and when they are not available—switchable channels of the public telephone network. Baud rates are from 500 to 4800.

4.9. "KATYUSHA" Telecommunications Network

The "KATYUSHA" network is a document exchange network that offers the user a wide range of electronic commercial services [30].

Operating Organization "International Information and Telecommunications Exchange" (MBIT) Joint Stock Company.

The main purpose of the network is to provide the capability for stock exchanges, brokerage offices and immediate producers of goods, regardless of location, to make single trades and have access to a wide variety of information databases.

Communications Services. The network offers the following kinds of services: e-mail, on-line and off-line access to network databases.

E-mail allows transmission of arbitrary messages (letters) to any network user, user group, all users or the network administration both in the local region and in other regions of the CIS, as well as in other countries.

The e-mail system is based on international standard allowing access to any foreign e-mail.

Off-line access to network databases enables users or the administration to route requests for information retrieval by e-mail orders. Advantages of the service are that the user need not have expertise in the whole set of databases, methods of searching them, classifiers, key words, and so on. It suffices to formulate a request in general form, and the system will effectively look up all necessary information without user intervention.

On-line access to network databases enables the user to carry out independent search operations in databases, select and read necessary information in real time. In this context, the user has a catalog of accessible databases and descriptions of rules for working with them. An advantage of the service is that the user buys information after personally making sure that it is needed.

On-line access to databases is a more immediate method of getting information in real time.

Information Services. Among these are subject-area databases and a bulletin board.

On the first stage of network operation (1992), the following databases are accessible to users:

- stock exchange offices;
- stock exchange bulletins;
- Russian legislation;
- advertisements in 130 newspapers and journals, on radio and TV;
- complete registers of CIS enterprises and registers of foreign companies;
- supply and demand;
- personals ("Who's Who").
- bulletins of information agencies, press digests

All network information users are provided with continuously updated electronic catalogs containing complete information about all network users, a listing and description of available databases, information about services and current prices for network operation.

The bulletin board allows the user to post commercial notices in appropriate subject areas on "boards" that are accessible to users of a specific region or to network users. The user may also read required information in subject areas from local or central bulletin boards.

Electronic Commercial Operations. Among these are:

- providing the technical and legal capability of remote conclusion of deals on single interregional auctions;

- providing the technical and legal capability of remote conclusion of contract-agreements for buying and selling goods on various exchanges of the country, in trading companies, and so on, between system users not on the exchange;
- providing comprehensive protection of information and communications resources of the system and juridical legality of operations transacted on the basis of a digital signature.

Method of Forming Secondary Network. On subscriber sections—switchable channels, on trunk sections—dedicated channels.

Network Topology. On the first stage, it is proposed that regional centers be set up in 24 cities of Russia and CIS nations. On the second stage, the network topology is to be expanded by instituting regional centers in 52 cities.

Interfacing With Existing Networks. Plans have been made to provide gateways for the network to all existing Russian data networks: "INFOTEL," "ROSPAK," "ISKRA," "ISTOK-K," "RELCOM," "SPRINT" and others, and to systems operating on these networks, and also directly to foreign data networks without Russian intermediaries.

Rates. According to data of [30], the cost of connection to the system and software has been discounted by 50 percent for MBIT shareholders (cost of a personal common share in MBIT Joint Stock Company is 50,000 rubles).

Price list for MBIT shareholders, rubles:

1. Information user—5,000 2. Trading user—10,000 3. Collective trading user (25 user sites)—50,000 4. Remote broker—15,000 5. Collective remote broker (exchange)—100,000 6. Central broker—500,000

Charges for software, instruction and digital signature:

1. Information user—5,000 2. Trading user—10,000 3. Collective trading user—30,000 4. Remote broker—15,000 5. Collective remote broker (exchange)—50,000 6. Central broker—40,000

For non-shareholders, these prices are doubled.

Monthly user service charge:

1. Information user—100 2. Trading user—250 3. Collective trading user—350 4. Remote broker—500 5. Collective remote broker (exchange)—5,000 6. Central broker—1,000

Terminal Equipment. The network users are hardware-software packages based on computers compatible with the IBM PC AT/XT equipped with modems that support MNP-5 protocols, and telephones.

Characteristics of Data Transmission Facilities. Access to the network is through switchable communication channels (serial numbers for 16 inputs each), and dedicated communication channels of "IASNET," "SPRINT," and "INFOTEL" (in future through channels of "ISKRA," "RELCOM" and "ROSPAK"). The central node of the network is located in Moscow.

Dedicated communication channels are used between regional centers and the central node of the "KATYUSHA" system. Message packets can be transmitted on this level by using existing networks: "RELCOM," "IASNET," "ISKRA," "SPRINT," "ROSPAK," "INFOTEL" and others, whose subscribers become regional centers and the central node. This allows rapid expansion of the geography of regional centers of the system, reduction of expenses on leasing the dedicated channels themselves, and an increase in the reliability of information delivery.

Exchange Protocols. The network is constructed in accordance with international standards. Information is transmitted by ptorocol X.25. The network is compatible with foreign packet switching networks, which makes it promising for integration with foreign trading and information networks.

Characteristics of Hardware and Software. The network is constructed in accordance with a three-level hiearchical principle:

First level—central network node (TsUS).

Second level—regional network nodes/regional centers (RUS).

Third level—network users.

The hardware base of the first stage of network construction is computers of class At 286 (user automated work stations), 386 (regional centers) and 486 (central node), packet switching centers produced by VNIIPAS, X.25 boards, V23 and V.32 modems, and other standard equipment, makeing network impelementation simple anc inexpensive.

4.10. "LEK TELEKOM" Computer Information Network

The "LEK TELEKOM" global computer information network offers e-mail services and a package of information services to users situated on the entire territory of the former USSR. The network works with information of various kinds: text of any format; files, characters and tabular data; fax and graphic images. The network completely meets ISO and CCITT standards, operates on imported equipment (IBM-compatible PCs, Hayes modems) and Russian software.

The operating organization is the "LET TELEKOM" Company.

Communications Services. The basic service of this type is e-mail. Provision is made for using personal or functional mailboxes.

Each network subscriber has his own e-mailbox located in a regional communications node. Messages addressed to a subscriber accumulated in the personal box, whose contents can be examined at any convenient time. The subscriber is offered the capability of having an additional personal box in other regional nodes.

Access to information in the functional mailbox (FMB) is possible for a certain group of subscribers formed by the

administration of the network and the regional node. The FMB may contain information distributed by subscription, or any other information requiring limited access.

The subscriber part of e-mail provides for:

- sending single- or multiple-address messages with files of any type;
- capability of receiving a confirmation (receipt) of delivery of the message to the addressee;
- reception of information from the personal mailbox;
- creating an archive of received and dispatched messages.

The following e-mail functions are realized in the regional node (RN):

- reception (transmission) of messages of subscribers connected to the RN;
- automatic issuance of a receipt when the subscriber gets a message addressed to him;
- automatic deletion of messages when storage time has elapsed;
- message switching in accordance with the recipient address indicated in the message heading;
- opening of functional mailboxes intended for closed user groups;
- automated billing for services to RN users;
- generating and changing user passwords.

The network provides transmission of information of various kinds: texts, files, tables, fax and graphics images. When operating with stationary graphics images, they can be processed in PCX and TIFF formats. these formats enable network processing of information obtained from practically any fax machines and scanners, as well as graphic slides and PC screen dumps. Thus, fax information (including documents with seal and signature) can be transmitted in the network in the sequence "fax-PC-network-PC-fax" along with black and white information in A4 format in the sequence "scanner-PC-network-PC-printer."

Information Services. The network has a bulletin board (based on a general-access functional e-mailbox). Network subscribers have the capability of posting messages on the board, making them accessible to all network subscribers, or only their own RN. Notices are left on the board for a time set by the subscriber, after which they are automatically deleted; messages can be removed prior to the set date. Usually the BBS messages contain commercial information.

The information base of the network provides users with the following kinds of information:

- stock exchange information (daily bids and trading summaries on the nation's major exchanges, activity of stock exchange transactions, dynamics of prices, and so on);
- juridical information (normative acts that have been passed and their practical application, content of normative acts);
- commercial information posted on the bulletin board by "LEK TELEKOM" network subscribers, and also obtained from other networks (announcements of purchases, sales, exchanges, advertisements, and so on);
- analytical reviews of a commercial nature.

Electronic Commercial Services. Network facilities include applied software developed to enhance effectiveness of work in "LEK TELEKOM" for brokerage offices that use stock exchange data in their operations. Among these facilities is a "stock exchange-broker" software package and a universal "broker automated work station."

Method of Forming Secondary Network. Switchable OGSTFS lines on subscriber sections of the network, switchable OGSTFS channels or dedicated (leased) channels of the primary State network on trunk sections.

Network Topology. "LEK TELEKOM" includes more than ten regional nodes and several hundred subscriber stations situated on the entire territory of the USSR in more than 100 cities. New nodes are set up as the network expands and when a certain number of subscribers is reached in a specific region. The central node of the network is located in St. Petersburg.

Information Security. On the subscriber level, messages transmitted to the network are encrypted by a network or personal key.

Terminal Equipment. The subscriber stations of "LEK TELEKOM" are hardware-software packages based on IBM-compatible PCs (standalone or incorporated into LANs).

Applied Use of the Network. "LEK TELEKOM" resources are used for trading transactions on the Russian Computer Stock Exchange.

Characteristics of Data Transmission Facilities. Switchable public telephone channels are used for calling between nodes and subscriber stations. Calls between regional nodes are made over switchable public telephone channels, "ISKRA-2" channels and dedicated channels. Data exchange rate is 9600 bauds in trunk channels between nodes, and up to 2400 bauds in subscriber channels.

The subscriber station hardware-software facilities provide automatic data compression, and when sending they break up messages into packets of regular length depending on the quality of the communication channel, preserving information already received when the connection is broken.

Hardware-Software Characteristics. Regional nodes (RN) of the network are based on IBM PC/AT 386 or 286 computers, depending on the number of subscribers connected to the RN. Subscriber stations may use PC/AT-286 computers.

Regional nodes and subscriber stations use imported Hayes-compatible modems, and duplex data exchange in accordance with V.22-bis, V.32 and V.42-bis standards.

The architecture of network software corresponds to the seven-level standard open systems interaction model in accordance with CCITT recommendations series X.200. "LEK TELEKOM" network software is subdivided into node software and subscriber software. The network software offers a whole package of e-mail services in accordance with CCITT recommendations series X.400, and is proprietary software of the "LEK TELEKOM" Company.

4.11. "MIR" Cooperative Business Association Network

The "MIR" [Mezhdunarodnyye intellektualnyye rynki: International Intellectual Markets] ADS [Assotsiatsiya delovogo sotrudnichestva: Cooperative Business Association] network [1, 2, 23, 39] is a network of information centers on the territory of Russia and states of the former USSR that offer regional commercial information.

Operating Organization: ADS "MIR."

Communications Services. The "MIR" network offers "Epos" e-mail service for:

- sending messages and files between network users;
- sending messages and files to other e-mail networks: "RELCOM," "SOVAM TELEPORT" and others;
- entering information about subscribers and their commercial services in European (German) on-line databases;
- periodically placing in the subscriber's e-mailbox all new announcements of commercial offerings of the "MIR" BBS;
- sending to the user's e-mailbox stock exchange information about commodities being offered in auctions from various exchanges, and on specific commodities;
- delivering to the subscriber's e-mailbox information about enterprises that produce goods in a user-specified profile;
- weekly presentation of tables of average prices on CIS exchanges, listings of deals in the 15-20 largest CIS exchanges and with respect to 15-20 major groups of commodities.

Information Services. BBS, access to subject-area databases, teleconferencing. Information is contained in a data bank with more than 10,000 documents, each with up to 2500 characters, in the following sections:

- information about databases;
- bank of business offerings;
- register of enterprises.

The individual business offering data bank contains at least 50,000 continuously updated messages. The BBS uses software technology that provides immediate access to a commercial data bank.

Network Topology. The network includes up to 50 regional centers and 2500 subscribers.

Rates. The network charges the following rates for services:

a. e-mail [39]:

- initial hookup 26,000 rubles;
- connect time 4 rubles/minute;
- information exchange 4 rubles/kilobyte;
- subscriber information storage 2 rubles/kilobyte/day;

b. information services [1]:

- subscriber service 13,000 rubles/year;
- downloading information 5,000 rubles/year;
- uploading information 2,000 rubles/quarter;
- posting ads (one page of 2500 characters) 800 rubles for 3 months;
- software and equipment for private database management to set up a regional center 70,000 rubles.

Terminal Equipment. IBM PC XT/AT computer, Hayes-compatible modem, ordinary switchable telephone channel.

4.12. "PIE-NET"

The "PIE-NET" commercial open territorial information network [1, 2, 3] provides interaction within the network and with outside networks in accordance with requirements of ISO standards. Users are offered e-mail services for worldwide message transmission, access to telex, telegraph and fax networks, electronic fund transfer for automatic banking and settling mutual accounts of subscribers. The network provides continuous electronic auctions in accordance with the regulations of stock exchange transactions in the United States and Western Europe.

The operating organization is PIE Systems, Inc. and "PAYNET" Limited Partnership.

Communications Services. Services of this type include e-mail and calls between any two terminals. E-mail is intended for exchange of messages between "PIE-NET" users and other networks having gateway-converters of protocols for interfacing with X.400 networks. Within the scope of "PIE-NET" are subsystems that support message exchange with owners of fax machines, telegraphs and telexes. The e-mail user interface is a menu-driven system that provides for:

- writing, editing and sending messages to subscriber addresses;
- using a prepared address book to speed up mail handling;
- successful organization of the operation of an "electronic office" by putting all messages into "folders" with capability of automatic sorting of documents, deleting them, and moving them between folders;
- initializing a preset process upon receipt of a message of a certain type.

The system for calls between any two terminals via a switchable telephone network gives a subscriber the capability of automatic dialing, automatic and interactive exchange of information, and control of the modem and remote terminal.

Electronic Commercial Services. "PIE-NET" provides electronic fund transfer and an electronic trading (stock

exchange) system. Electronic data exchange is intercomputer exchange of business information in the EDIFACT international standard format. Standard forms of negotiable instruments that are at the disposal of users and can be easily created within the framework of the "PIE-NET" software system allow only the variables of these forms to be sent, considerably reducing the amount of information transmitted. The capability of polyglot communication of the subscriber with the system enables automatic generation of received instruments in the languages of CIS nations and major world languages.

The software system includes the capability of launching appropriate software packages for settling the mutual accounts of users upon receipt of some negotiable instrument.

The "PIE Trade-Net" electronic trading system is implemented with allowance for all regulations of exchange trading in the United States and Western Europe. The electronic stock exchange enables location of suitable partners for concluding any deals (buying, selling, services) while maintaining interaction of clients, brokers and stock exchanges.

The system operates in both interactive and automatic modes, requesting information and obtaining complete descriptions of the appropriate commodities on the exchange. When the user submits bids for concluding deals, the mode of searching for commodities in the database and comparing their characteristics is activated. When requirements coincide, the users are offered data for concluding the contract.

Method of Organizing Secondary Network. Switchable and dedicated (leased) OGSTFS channels and primary channels of the State network.

Network Topology. At the present time, regional "PIE-NET" centers are operating in Moscow (4 centers), Yekaterinburg, Tbilisi, Donetsk, Tallinn, Minsk and Gorno-Altaysk. In the near future, central post offices are to be set up in Khabarovsk, Rostov and St. Petersburg.

Information Security. "PIE-NET" technology permits transmission of information that meets ISO requirements for assurance of a high degree of reliability and security of document transmission, which is especially important in settling mutual accounts. This is achieved by using a digital signature based on the RSA algorithm, preventing unauthorized access to the network by using passwords in modems and reverifying users by dialback.

Rates. "PIE-NET" users pay for the following services [1]:

- subscriber registration 18,000 rubles;
- monthly service charge 1,200 rubles.

Characteristics of Data Transmission Facilities. "PIE-NET" is a distributed network that includes message switching centers (electronic post offices) and subscriber stations connected by a variety of communication lines (telephone, radio relay, satellite, and others).

Interaction Protocols. "PIE-NET" uses standards and protocols recommended for open information systems by the International Standards Organization (OSI/ISO):

- X.400—information transmission and processing systems of e-mail type;
- X.435, EDIFACT—electronic data exchange systems, including EFT, and exchange of trading, administrative and other documents;
- recommendations on setting up network reference services, including X.500;
- X.25—packet switching data transmission systems;
- X.121—calls between carrier networks.

Characteristics of Facilities. E-mail post offices support reception of messages from subscriber stations connected to them, other e-mail post offices or external channel switching networks (AT-50, Telex, Public Telephone, Telefax, X.25), routing incoming messages, processing them, and transmitting them to destinations. Subscriber stations are designed for creating, processing, sending/receiving, and storing various kinds of information, including letters, negotiable instruments as tables and forms, digitized video and graphics information. Most modern computers and operating systems can be used in e-mail post offices and subscriber stations. Subscribers may be users of other systems, such as telegraph and fax systems, and also LANs.

4.13. "RELCOM" Network

The "RELCOM" common carrier document exchange network [1, 2, 15, 80], set up by the Soviet UNIX Users Association (Computer Information Center of Kurchatov Nuclear Power Institute, MNIOPK "Demos" [not further identified], "Dialog" Joint Venture) in mid 1990, provides message transmission by e-mail inside and outside of the country. Officially registered and licensed as a national section of the "EUNET" European network.

Operating Organization: MNIOPK "Demos."

Communications Services. The e-mail offered in "RELCOM" is designed for message exchange between "RELCOM" users and the users of other networks compatible with the Internet message format. Messages consist of a header that contains service information, and text (Cyrillic and Roman letters, binary codes, graphics). The user communicates with e-mail by means of the "Mail" Network that allows reception and transmission of messages, sorting, archiving, retrieval from the archive, and so on. Each user in the network has an address that shows mail programs where to deliver messages.

Information Services. The "RELCOM" network provides the capability of access to subject-area databases, user participation in teleconferencing, and access to electronic newsletters.

Databases accessible to users contain commercial information about buying and selling (500 proposals per day), stock exchange offices, and so on [80].

USENET netnews provides a means for exchange of news articles among users worldwide. Each user having access to

USENET can read any article or send one himself. The articles exchanged by netnews participants have the same form as e-mail messages, but also contain certain added fields in the header. Netnews articles are divided into interest groups. There are now several hundred groups, and information volume in these is about 5 megabytes per day. News reading programs enable the netnews participant to subscribe to the groups that he wants to receive.

"RELCOM" has opened subscription to the newsletter "The Teleputing Hotline" that comes out twice a week (an issue is about 18 kilobytes), and is edited in Atlanta and London. The Russian edition of "The Teleputing Hotline" is based on news posted by the independent information agency "Newsbytes News Networks" on problems of development of the electronics and computer industry and communications.

Method of Organizing Secondary Network. OGSTFS switchable lines on subscriber sections of the network, OGSTFS switchable channels or dedicated (leased) channels of the primary State network on trunk sections.

Territorial Location of Network Components. The network serves more than 15,000 subscribers in more than 250 CIS cities.

Interfacing With Other Networks. As a national network, "RELCOM" is part of the European network "EUNET," and therefore agreements concerning exchange of mail messages existing between "EUNET" and such international networks as the Internet, UUNet, BITNET, CompuServe and others are extended to the "RELCOM" subscriber as well. The capability of working in a system of international conferencing is provided (USENET).

Rates. "RELCOM" charges for services at the following rates [1]:

- user registration 3000 rubles;
- monthly service charge 2400 rubles;
- charge for additional billing name 1000 rubles;
- data transmission: in Russia 1 ruble/kilobyte; within a region without using international calling 0.2 ruble/kilobyte; between regions 1 ruble/kilobyte; foreign 7 rubles/kilobyte;
- obtaining information from electronic bulletin 0.3 ruble/kilobyte;
- teleconferencing: inside the country 0.3 ruble/kilobyte; foreign 0.5 ruble/kilobyte.

Characteristics of Service Quality. Average time of undistorted exchange of messages, graphics images and software is two hours; maximum time of exchange is four hours with subscribers in any world location.

Terminal Equipment. To be connected to the network, a subscriber must have a computer compatible with PC XT/AT, SM or VAX, and a modem.

Status and outlook for network development. In 1991, computers of about 300 organizations from 40 cities of the CIS were operating in the "RELCOM" network, including science organizations, joint ventures, stock exchanges, public organizations and information agencies. At present, "RELCOM" e-mail is being used by 15,000 subscribers from 250 cities of the CIS.

Characteristics of Data Transmission Facilities. The "RELCOM" network is an aggregate of regional computers, each providing exchange of messages in its own telephone area, and transmitting intercity dispatches to another regional computer. As a rule, network subscribers exchange messages over ordinary switchable lines, using 1200/2400 baud modems. Regional computers are connected either by dedicated lines, or use switchable lines of a conventional telephone network or channels of the "ISKRA-2" network. For switchable lines, equipment is used that enables attainment of a rate of about 9600 bauds.

Characteristics of Hardware. Node machines of the "RELCOM" network are based on microVAX computers.

4.14. "REMART" Telecommunications Network

The "REMART" network [85] is designed primarily for offering commercial services to users. The communication and information services now offered mainly play a supporting role in the network; however, future plans call for independent development and improvement of such services.

The operating organization is the "Russian Commercial Initiative" Joint Stock Company.

Communication Services. Among these are e-mail, reception (dispatching) of telex messages, network directory services.

Information Services. This class of services is represented in the netowrk by teleconferencing, access to subject-area databases, libraries, games. It is possible to organize competitions, surveys, ordering and reservation systems (tickets, passes, lodging, and so on). Plans are being made for publishing electronic newspapers and newsletters.

Electronic Commercial Services. Services of this kind are most highly developed in the network. Among these are electronic stock exchanges, auctions, department stores, trading companies. Facilities are provided for interbank transactions. These services are considered in more detail in Chapter 7.

Method of Forming Secondary Network. Switchable and dedicated (leased) public telephone communication channels, radio channels, satellite channels.

Network Topology. Switching centers and terminal concentrators are located in various cities of Russia and Kazakhstan.

Interfacing With Other Networks. At present, interaction is supported with "SPRINT," "IASNET," "RELCOM," "ROSPAK," "INFOTEL" and other lesser known networks.

Characteristics of Information Transmission Facilities. When two-wire telephone channels are used, operating

speed is 57,600 bauds, with four-wire (synchronous) telephone lines—as high as 150,000 bauds, and with X.25 lines—72,000 bauds per port.

Interaction Protocols. The network uses the following data exchange protocols: asynchronous, X.25, IPX, SPX, Novell for LANs, file exchange protocols ASCII, Kermit, X-, Y- and Zmodem, and so on. Built-in data packet adapter functions are implemented (X.3, X.28, X.29).

Hardware-Software Characteristics. Network facilities include a host computer based on a 286/386/486 processor, an electronic switch (interface expander), and data transmitters (modems, multiplexers, network adapters).

The operating system is specialized, multitasking, multiple-user.

Outlook for Network Development. Provisions have been made to:

- develop network topology, set up regional information centers on a commercial basis in conjunction with local communications enterprises;
- introduce updated communication facilities with gradual replacement of dedicated surface channels on trunk lines by high-speed satellite channels;
- introduce e-mail systems with the use of MHS, SMF-70 and X.400 standards with built-in fax and telex services.

4.15. "ROSPAK" Data Network

In 1991, Intertelkom Joint Stock Company (de facto holder of primary intercity channels in the nation) and the Institute of Automated Systems—IAS (formerly VNII-PAS) decided to set up the "ROSPAK" common-carrier packet switching network in Russia [21, 22]. The creation of this network pursues the following goals:

- introduction of qualitatively new services offered to users (organizations and private individuals) on a commercial basis with the use of advanced information technologies and up-to-date telecommunication facilities;
- enhancement of effectiveness, reliability and immediacy of information exchange between territorially dispersed facilities of various organizational structures (agencies, associations, joint stock companies, companies, and so on) in the process of preparing, storing and processing information;
- ensuring and enhancing efficiency in the interaction of Russian and foreign organizational structures with respect to data exchange.

The engineering and organizational principles of construction of the "ROSPAK" network correspond to the principles of construction of other secondary networks of the Intercoordinated Communications Network of the Russian Federation (VSS RF), and embody the following basic provisions:

- "ROSPAK" network is constructed as a national Russian data network open to access by any subscriber and other data networks on the territory of Russia with payment in rubles for services offered on its territory;
- "ROSPAK" network conforms to CCITT recommendations and has been assigned international Number 2500;
- "ROSPAK" network provides interaction with Russian and foreign data networks and automated databases (ADB), and interacts with common-carrier networks of the VSS RF of telegraph and fax communications type.

"ROSPAK" network consists of:

- a main packet switching data network (PSDN);
- PSDN zone networks.

The network will be set up, developed and operated by the specially created "ROSPAK" Joint Stock Company founded by Intertelkom and IAS.

Communications Services. At the present time, "ROSPAK" network offers users the following services:

- connection of subscribers to the network in accordance with CCITT recommendations X.3, X.28 and X.29 over dedicated or switchable telephone channels (asynchronous subscribers);
- e-mail;
- use of communications software packages for connecting computers to the network;
- access to foreign data networks and ADBs;
- interaction with subscribers connected to other similar networks.

In future, the number of services will be expanded in accordance with CCITT recommendations.

Along with data transmission services, the network will use telematic common carrier services like teletex, telefax and videotex.

Method of Forming Secondary Network. Switchable OGSTFS lines on subscriber sections. Dedicated channels of the primary State network on trunk sections.

Network Topology. An experimental section of the network that includes 10 cities of Russia has now been set up and put into trial operation. It is anticipated that commercial operation of this section will start in the third quarter of 1992. The network is to cover as many as 35 Russian cities in the second half of 1992, 100 in 1993, and up to 150 in 1994. Within the framework of the experimental section, users will be offered services in data transmission, e-mail, file transfer, and access to databases and the network reference information system.

Interfacing With Other Networks. The experimental section of the network is connected via a special gateway node that handles X.75 protocol to the "IASNET" packet switching network. Interaction with other similar networks is planned: "SPRINT," "RELCOM," "INFOTEL" and others.

Characteristics of Data Transmission Facilities. The trunk data network connects packet switching nodes of different zones. To ensure reliability and viability of the trunk data network, the hardware and software packages are generally located in protected facilities of the primary VSS RF network with tie-in to nodes of this network.

Packet switching nodes of the trunk network are interconnected, mainly by the principle of "each to each."

A zonal packet switching data network consists of:

- an intrazonal packet switching data network;
- local packet switching data networks located on the territory of the zone.

The intrazonal packet switching data network connects packet switching nodes or terminal concentrators (TCs) of various local networks and provides access to the trunk network and international packet switching data networks.

Since the "ROSPAK" network uses standard AF channels formed by a variety of transmission systems (cable, radio relay, satellite, fiber optics, UHF-radio), this network can be enabled under various conditions of the internal and international situation, including in a state of emergency.

Characteristics of Facilities. The network will use both Russian packet switching equipment developed by IAS (on subscriber sections of the network), and foreign equipment of the French-Belgian Alcatel Company (on trunk sections of the network), which will allow rapid deployment of the network throughout the entire nation and reduce cash expenditures on setting it up. The network will use dedicated medium-speed and high-speed internode communication channels (from 2400 to 64,000 bauds), as well as switchable telephone channels (from 1200 to 2400 bauds) on subscriber lines.

The data transmission rate in the working zone of the network is 2400 and 4800 bauds, and by the end of the year will be increased to 9600 bauds on some lines.

4.16. "SEDAB" Information and Communication System

The "SEDAB" system [1, 2] offers users up-to-date telecommunications services and access to a variety of commercial information. Any enterprises and organizations with direct dialing to Moscow may become system users.

The operating organization is the OCTOPUS-Varioline Company (Germany).

Communications Services. E-mail, international telefax and teletype with any company in the world.

Information Services. The "SEDAB" network enables:

- acquisition of detailed information about more than 100,000 enterprises of the former USSR and leading Western nations that offer equipment, goods and services;
- searching for companies that produce more than 40,000 items of goods and services (coding of items based on Harmonized System);
- acquisition of current rates of exchange and price quotations on major world commodity exchanges;
- access to the information exchange of commodities and non-disposable goods on the internal market.

Rates. The cost of a license for using all services of the "SEDAB" network is 25,000 DM [1]. Clients are served in accordance with contracts for hard cash or equivalent rubles at the current rate.

4.17. "SITEK" Global Teleinformation Network

The "SITEK" network provides users with a wide range of communications, information and commercial services [51, 80]. The operating organization is the "MASTAK" Scientific Production Company.

Communications Services. Network subscribers are offered services in e-mail, fax and telegraph communications. E-mail provides 24-hour exchange of messages with subscribers in any world nation. Provisions are made for confirmation of delivery, multiple-address distribution of messages, delivery of messages to an addressee at a convenient time.

Information Services. Network subscribers are provided with access to bulletin boards and to information contained in a variety of subject-area databases.

Electronic Commercial Services. The "SITEK" network provides an electronic mall and access to reference information of a stock exchange database.

Method of Forming Secondary Network. Subscribers are connected to network regional nodes by switchable channels of the State telephone network.

Network Topology. Network subscribers may now be located in more than 180 cities of Russia, the CIS and the Baltics.

Information Security. Encryption and electronic signature facilities are used.

Terminal Equipment. Depending on subscriber needs, the terminal equipment may be a PC (with modem), telegraph, fax, or fax/modem. Having any of the listed equipment, a network user has the capability of sending and receiving telex and fax messages, telegrams, and e-mail.

ISM-1200, ISM-1200M and any internal or external Hayes-compatible modem of V22 or V22-bis standard with MNP5 (implemented by hardware or software) can be used with IBM PC XT/AT computers.

If the user has an "ISKRA," "TURBO" or "ROBOTRON" computer, connection to "SITEK" can be organized by using the ISM-1200 modem.

4.18. "SOVAM TELEPORT" Network

The "SOVAM TELEPORT" network [1, 2, 38] is a commercial telecommunications network that provides data exchange among more than 500 users worldwide, and enables academic institutes, companies and private businessmen to exchange information about scientific projects and the state of affairs in various branches of industry. The

network supports coordination of U.S.-Soviet cooperation in the area of setting up joint enterprises by on-line exchange of information between organizations and private individuals.

The operating organization is the Sovam Teleport joint enterprise formed by the All-Russian Scientific Research Institute of Applied Computer-Aided Systems (VNIIPAS) and San Francisco/Moscow Teleport Company (United States).

Communications Services. Access is provided to subject-area databases with ecological, medical and scientific information.

Method of forming secondary network OGSTFS switchable channels.

Network Topology. Regional teleports of the network are located in Moscow and St. Petersburg.

Interfacing With Other Networks. The international network is accessed through the teleport in San Francisco communicating with Moscow via satellite.

Rates. Charges for e-mail are as follows [38]:

- registration fee 2500 rubles;
- advance payment for use of services 3000 rubles;
- monthly service charge for use of name 1000 rubles;
- connect time 0.95 ruble/minute;
- transmission of 1 kilobyte of information:

—in foreign network 9.95 rubles;

—in local network 1.95 rubles;

—within system 0.95 ruble;

reception of 1 kilobyte from foreign network 4.95 rubles;

private teleconferencing:

—open teleconferences 1000 rubles;

—subscriber charge 1000 rubles;

equipment installation, technical support 1000 rubles/hr.

Payment for telex and telefax message transmission in the network is made in freely convertible currency or rubles at the international par rate of exchange on the billing date in accordance with rates given in Table 4.1.

Table 4.1. Flat Rates in "SOVAM TELEPORT" Network (U.S. Dollars)

Country	Telefax Delivery		Telex Delivery Per Minute
	First 30 s	Each Additional 6 s	
United States	0.20	0.01	1.14
Mexico	0.20	0.01	1.94
Great Britain	1.14	0.10	2.02
Japan	2.81	0.13	3.25
Singapore	3.06	0.15	3.13
Western Europe	1.38	0.11	1.69
Eastern Europe	1.96	0.14	3.22
Israel	2.76	0.13	3.22
China	5.85	0.14	3.20

4.19. "SPRINT NETWORK"

"SPRINT NETWORK" is a data transmission and document exchange network that affords users access to international networks [1, 2, 37]. The operating organization is a joint enterprise created by the corporation "Sprint International" (United States) and "Central Telegraph" Production Association (Moscow).

Communications Services. "SPRINT NETWORK" offers e-mail services providing rapid and reliable communication in the most diverse forms, including exchange between e-mailboxes, delivery to telex and fax, and hard-copy mail delivery.

The capability of setting up and using electronic forms and private bulletin boards in the e-mail system is the basis for such types of application as placing orders, controlling sales, and making financial reports. "SPRINT NETWORK" is now being used by more than 20 countries as a common-carrier e-mail service.

"SPRINT NETWORK" provides transmission of information with intermediate accumulation and storage with a high degree of reliability between fax machines worldwide. Provisions are made for sending information simultaneously to several addresses. This service is tailored for large companies and organizations with a large volume of fax transmission and high requirements for monitoring delivery of information.

Method of Forming Secondary Network. Dedicated (leased) OGSTFS lines on subscriber sections, switchable OGSTFS channels on trunk sections of the network.

Network Topology. At the present time, "SPRINT NETWORK" packet switching modes have been put into operation in Moscow, St. Petersburg, Kiev, Khabarovsk, Samara, Perm and Novosibirsk. During 1992, packet switching nodes were introduced that are connected to the central node in Moscow, Riga, Odessa, Yekaterinburg, Tomsk, Chelyabinsk, Petrozavodsk and Nakhodka.

Interfacing With Other Networks. "SPRINT NETWORK" provides interaction with common-carrier networks of similar type that support X.25 protocol.

Status and Trends of Development of the Network. "SPRINT NETWORK" has set up more than 150 networks operating in more than 30 world nations. Many of these networks belong to and are operated by the postal, telephone and telegraph State administrations of communications of these nations as common-carrier data networks.

"SPRINT NETWORK" plans and implements turnkey local and global data networks on the territory of all states of the former USSR and elsewhere that are provided with special equipment and software for transmitting large volumes of data between regions that are geographically remote. "SPRINT NETWORK" has at its disposal the whole necessary arsenal for setting up packet switching networks, including high-quality equipment for network access with load concentration, packet switching nodes, network control computer centers and communications offices.

Characteristics of Data Network. "SPRINT NETWORK" offers the user a dedicated link within Moscow city limits for connecting terminal data equipment to its assigned port in the switching node of the network. In doing so, payment is set for exchange within the confines of the network depending on the volume of transmitted data without regard to connect time. In the case of connection to other networks, there is a surcharge for connect time in addition to the volume of data recoding.

"SPRINT NET" offers the user within the framework of the system an internal dedicated channel that can be conveniently used, say, for connecting two computer facilities with large traffic of exchange between them. In addition to virtual point-to-point calls, capabilities are available for connection to other addressees. Charges for such services depend on connect time.

"SPRINT NETWORK" allows connection to a network packet switching node via the switchable Moscow municipal telephone network. When this is done, the user acquires access from his terminal, personal computer or LAN to necessary databases, computers or other terminal systems that are callable by a mnemonic or network address in accordance with CCITT recommendations X.121. Identification and billing are based on the network names of users. When the packet switching network is reached by dialing the switchable telephone network, access is provided to network resources with payment for connect time only, regardless of the volume of transmitted data and baud rate.

Characteristics of Facilities. "SPRINT NETWORK" includes the following components:

- packet switching nodes that provide flexible and trouble-free data transmission, concentration and selection of a data transmission path in the system itself and beyond its confines;
- switching facilities that are the core of the trunk network;
- network control facilities that enable centralized tracking of the configuration of resources in the network, remote diagnosis, and real-time instantaneous monitoring of network operation;
- integrated carrier facilities that transmit speech, data and video images over a unified highly efficient and economic trunk.

4.20. "SET BLITS" Network

The "SET BLITS" territorially distributed commercial information network [1, 2, 19, 89] provides a wide range of informational and commercial services for various levels of users.

"SET BLITS" is designed for use in commercial trade organizations, on stock exchanges, in trading companies, banking institutions, and organizations that offer commercial and information services.

The operating organization is the "SET BLITS" Company.

The system is a centralized data bank that stores client offerings. The system is realized as a PC LAN with outputs to external users via a switchable telephone network.

Communications Services. The network provides intercomputer information exchange (both among subscribers of regional "SET BLITS" networks, and between regional networks), and also e-mail.

Information Services. These include interactive access to databases, and computerized teleconferencing.

Electronic Commercial Services. Primary among the applied information services that "SET BLITS" offers to its users are:

- access to direct interactive exchange of information between seller and buyer;
- intraregional and interregional telecommunications auctions;
- direct telecommunications calls between interested parties on trades and offering of services;
- interactive access to commercial information, particularly to information about stock exchange trading and price quotations.

Considering the specifics of economics of our nation, the "SET BLITS" Company has developed the concept of funds and commodities databases [tovarno-fondovyye bazy dannykh (TFBD)]. The TFBD stores facts about the availability of goods at different supplier subscribers of the TFBD at a given time. Access is by personal computer (IBM PC/XT/AT) and modem connected to the telephone network.

In addition to communications services, SET BLITS offers specialized financial telecommunications: the "Blits-Sekret" system of cashless settlements, sending, verifying and encrypting information. At the present time, system subscribers can use available electronic signature software

for these transactions, and the e-mail system will support distribution, transmission, acquisition and storage of information.

Method of Forming Secondary Network. Switchable OGSTFS channels.

Network topology. The physical configuration of the system is constructed on the basis of the following components:

- All-Russian Center;
- regional centers;
- oblast centers;
- municipal centers;
- stock exchange centers, enterprise centers, and so on;
- subscriber network.

The structure of the network is a tree with root in the All-Russian Center of "SET BLITS."

Information Security. Information is secured and identified by using:

- access passwords on several levels;
- electronic signature (in RSA international standard);
- encryption (in DES international standard).

Rates. According to data of [89], there are two different systems of rates for network services.

System 1 stipulates payment for the following services of the "SET BLITS" regional center:

- installation of "SET BLITS" system (regional center software package) $2400.00;
- cost of subscriber station $800.00;
- quarterly rental of subscriber station $120.00;
- six-months rental of subscriber station $210.00;
- annual rental of subscriber station $400.00; (payment for services can be made in rubles at the current exchange rate).
- viewing one department of the Electronic Department Store 25 rubles, and 5 rubles for each additional screen;
- hard copy of contents of a department of the Electronic Department Store 10 rubles per screen;
- viewing one commodity card 35 rubles;
- hard copy of one commodity card 50 rubles;
- viewing supplier card 50 rubles;
- hard copy of supplier card 100 rubles;
- posting sale item in the Electronic Department Store 600 rubles;
- purchasing item in the Electronic Department Store 400 rubles;
- posting notice (query) 200 rubles;
- sending message to one customer 10 rubles;
- sending message to all customers 40 rubles;
- sending message to one customer in interregional department store 25 rubles;
- sending message to all customers in interregional department store 200 rubles;
- viewing one message from Bulletin Board in hardcopy form 5 rubles;
- matching commodity for one site 1000 rubles.

System 2 stipulates payment for the following services of the regional center of the network:

- registration charge $50.00;
- monthly service charge $20.00;
- quarterly service charge $50.00;
- six-months service charge $105.00;
- annual service charge $200.00; (payment for services can be made in rubles at the current exchange rate).
- communications software 2000 rubles;
- turnkey installation of subscriber station 2000 rubles;
- charge for use of communication channel from 8:00 AM to 8:00 PM 2 rubles per minute for the first 15 minutes, and 4 rubles per minute thereafter;
- charge for use of communication channel from 8:00 PM to 8:00 AM 1 ruble per minute for the first 15 minutes, and 1.5 rubles per minute thereafter;
- offering item for sale in Electronic Department Store 200 rubles for the first 10 days, and 10 rubles per day thereafter;
- purchase of item in Electronic Department Store 500 rubles;
- filling out Bulletin Board user card 50 rubles;
- sending message to one customer 5 rubles;
- sending message to all customers 30 rubles;
- sending message to one customer in interregional department store 10 rubles;
- sending message to all customers in interregional department store 100 rubles.

Terminal Equipment. IBM PC XT/AT, modem.

Characteristics of Data Transmission Facilities. The basis of communications facilities is provided by switchable common-carrier telephone channels. Future plans call for:

- conversion by stages to the latest communications facilities (high-speed modems, digital and satellite channels, optical channels and so on);
- introduction of asynchronous modems with MNP data compression and correction protocols of classes 4, 5 and better at 1200-2400 bauds with subsequent conversion to synchronous protocols of communication between modems with asynchronous interface to terminal equipment (at present 300 bauds in duplex mode);
- use of "ISKRA" channels, and development or purchase of corresponding high-speed modems.

"SET BLITS" proposes in future to install concentrators within the framework of its network that will be connected to X.25 nodes for expanding user access capabilities. The concentrators will be accessed over both switchable and dedicated channels. This will enable fewer telephone numbers to be used directly at "SET BLITS" sites and will improve the quality of communications for subscribers of other cities and regions.

4.21. "TEKOS" Telecommunications and Message Processing System

The "TEKOS" system is a distributed common-carrier data transmission and processing packet switching network that conforms to CCITT recommendations X.25 and

is tailored for information interaction with personal computers of IBM PC/AT type. The system developer is the Central Scientific Research Institute of Machine Building in cooperation with enterprises of several ministries. The operating organization is TEKOS, Ltd. [34].

The "TEKOS" system consists of three subsystems:

- a packet switching data carrier network in X.25 standard;
- a subsystem for system user information support and network administration;
- an information security subsystem.

Communications Services. "TEKOS" subscribers are offered the following services:

- capatility of preparing information for transmiss on in the form of a variety of messages, documents, notices, reports and the like by using an editor built into the subscriber station;
- paperless exchange of information with correspondents (transmission and reception of documents, notices, spreadsheets, graphics and software);
- exchange of information in chat mode with any network correspondent by transmitting brief messages (up to 14 lines of 60 characters each) without the need of disk accesses;
- transmit/receive information simultaneously with 10 system subscribers (in both directions);
- reception of information from correspondents in "background" mode (while doing other jobs on the subscriber personal computer);
- exchange of information in the deferred delivery mode (with allowance for time zone differences) by using the mail service;
- supplemental service on processing and storage of information by automatically logging exchanges;
- printout of received information using a built-in modifiable driver.

Information Services. "TEKOS" network subscribers are provided with:

- automatic formation of menus of queries to selected databases;
- acquisition of information from remote databases as a response to a query formed by the user in interactive mode;
- capability of remote entry (deletion) of data in a leased user-defined database for disseminating information (including on a commercial basis);
- use of remote bulletin board systems;
- posting information, downloading information of interest to the user from a board, and so on;
- organization of real-time teleconferencing for a closed user group.

Electronic Commercial Transactions. The principal area of use of "TEKOS" is by stock exchange and banking systems. In this area, "TEKOS" provides:

- automatic dissemination of information about deals on stock exchanges at the given time (from the floor of the stock exchange);
- real-time participation in multiple-exchange trades;
- the right to open an electronic company;
- access to the directory service of a system of electronic trading companies.

The technology of handling remote trading (including auctions) was developed during the International Trades of the Congress of Stock Exchanges held in 1992 (Russian Commodities and Raw Materials Exchange, Asiatic Stock Exchange, Vilnyus Stock Exchange and several others).

Method of Forming Secondary Network. Switchable and dedicated (leased) OGSTFS channels and primary State network channels.

Network Topology. An experimental section of the "TEKOS" system was put into operation in September 1991, including a packet switching and network control center (Kaliningrad, Moscow Oblast) and subscriber stations in 12 cities. In 1992, proposals were made for developing the infrastructure of the network on the territory of Russia, CIS nations and nearby countries.

Information Security. The "TEKOS" information security subsystem has been set up in cooperation with InfoCrypt, Ltd., one of whose founders is the Russian President's Federal Agency of Governmental Communications and Informatics.

During 1992 (by stages), "TEKOS" system users were offered the following services in the area of information security:

- cryptographic protection of information with message transmission by the principle of subscriber scrambling with private keys (information can be descrambled only by communicating subscribers);
- providing a check on the authenticity and integrity of messages, their digital signature, impossibility of sender denial of transmitted messages and user fabrication of messages;
- cryptographic protection of databases and limited access to merged resources;
- protection of user storage facilities from unauthorized access;
- generation of the necessary key information that is autonomous to the specific system, and delivery through communication channels.

These capabilities ensure confidentiality of information exchange, its protection in the storage process, and also verification of the authenticity of information and its sources, which is fundamentally necessary for supporting various kinds of stock exchange and banking transactions (electronic trades, financial calculations, fund transactions, credit cards, and so on).

Interfacing With Other Networks. The "TEKOS" system is open to interaction with external telecommunications networks and information services (external databases and

data banks), including foreign networks (via internetwork gateways in accordance with CCITT Recommendations X.75).

Characteristics of Service Quality. Time of setting up a virtual call does not exceed 10 s (for dedicated communication lines) per transmission link under maximum load, and on average is not more than 3 s.

Average time of transmission of a packet inside the network should not exceed 30 s during peak hours (when the subscriber is using a set of virtual channels).

Probability of missing errors not more than 10^{-12}.

Probability of misrouting a message not more than 10^{-16}.

Network Users. At present, the services of the "TEKOS" system are being used by the Ministry of Finances, the Ministry of Defense, the Congress of Stock Exchanges, the Military-Industrial Investment Company, and some Russian stock exchanges and banks.

Characteristics of Data Transmission Facilities. Telephone communication channels are used (dedicated, switchable common-carrier, two-wire). It is being suggested that satellite channels be used on certain lines in 1992.

The range of transmission speeds is determined by Hayes-compatible smart modems that are used (in the base version for the subscriber 300-2400 bauds, on trunk cable channels as high as 9600 bauds).

EIA RS 232-C (V.24) is used as the DTE/DLTE interface.

The asynchronous balanced mode is used in data exchange with full duplex data stream.

Data transmission is provided without limitation on the length or nature of the transmitted information either with respect to the fixed virtual link or with respect to the switchable virtual channel.

Routing is quasistatistical with alternative selection.

Packet length in the base version is 128 bytes.

Window size on the network level is variable.

In the base version, provision is made for operation on one DTE/DLTE interface (for one direction) over 10 virtual channels.

On a DLTE/DLTE interface (for two directions), the number of logical channels can be increased by software to 256.

Exchange Protocols. The system has been developed in accordance with international standards series X.200, X.500 and X.800.

CCITT recommendations X.224 class "0" have been implemented on the carrier level (development of class "1" is now being completed).

Characteristics of Facilities. Components of the physical configuration of the system include communications computers, packet switching centers, and subscriber stations.

The communications computers (CCs) support protocol X.25 on the network level, and on the channel level—subset HDLC of LAPB/X.25: asynchronous balanced mode with full duplex data stream, but with the use of byte stuffing on the interface with the physical level. CCs use the strategy of channel queue restriction.

A switching machine serves as many as 16 communication lines. CC operating mode is automatic and round-the-clock. CC control is flexible: direct (local) and/or remote over communication channels. When using the IBM PC/AT 386 personal computer with speed of 33 MHz, the throughput of the CC is up to 120 packets per second.

The base version of the packet switching center (PSC) incorporates one CC per 16 communication lines and an administrative service machine; the capacity of the PSC is expanded by increasing the number of CCs.

Each packet switching center has outputs to a minimum of two centers.

Each communication line of the CC can be realized as a switchable (with telephone number), dedicated (leased) or intercomputer ("no-modem") line.

The number of subscriber stations connected to a PSC over switchable channels is determined by their traffic rate, and averages from 10 to 20 subscribers per channel.

Subscribers connected through switchable channels have the capability of access to the switching center via different telephone numbers.

Data are kept confidential and secure by special crypto- and simulo-protection firmware, assignment of passwords, and other methods.

A subscriber station (SS) is based on a PC/AT 286 personal computer and operates on a DOS 4.0 or higher platform.

The SS network software consists of two parts: a resident network interface (RNI) (required RAM about 100K) and a user interaction package (UIP). The UIP includes a simple text editor for quickly composing and reading messages, facilities for creating queries and processing replies when using network services (databases, BBS, e-mail and so on), provisions for checking and controlling the status of the RNI, capability of printing out messages, statistical data and the like. The UIP supports mouse control. The RNI can operate independently without the UIP, handling automatic reception, processing and recording (storage) of incoming information in the background mode.

The RNI is based on a universal algorithm and supports operation in the network of both user applications (SS, on-line systems, and so on), and system facilities (DBMS, BBS, e-mail, brokerage transactions).

The RNI realizes functions on the physical, channel, network and carrier levels (CCITT X.25 and X.224), as well as file reception/transmission, cryptosecurity, data compression, and the like.

4.22. Supplementary Information

The general list of telecommunications networks operating on Russian territory is not exhausted by the networks described in Chapter 4. Given below are brief facts about telecommunications networks for which the limited volume of data does not suffice for classification with respect to all selected characteristics.

Computer information network of the Academy of Sciences ("AKADEMSET"). Operation of the network was initiated by VNIIPAS in 1986 by using communication channels to link the computer resources of the USSR Academy of Sciences and the academies of sciences of union republics [17]. The purpose of setting up the network was to provide all users in organizations of the academies of sciences with the computer information resources of the Academy and foreign computer networks in the shared-use mode. The principal components of the network are switching nodes and terminal systems (based on SM computers), and working systems (based on YeS computers). The switching nodes are packet switchers with capacity of about 30 packets per second. The communication channels between nodes are dedicated channels leased from the Ministry of Communications. The network uses protocols that conform to ISO recommendations (Profile 2).

"DV-NET" Commercial Network. Operated by "DV-Partner" enterprise. the network is based on IBM PC AT/386 personal computers. Network topology is a "star" with center in Khabarovsk. Dedicated communication channels connect the central node to other nodes in Vladivostok and Petropavlovsk-Kamchatskiy. Users are offered e-mail and BBS services. Plans are being made to organize communication with Moscow over a dedicated channel. Network services are used for organizing unified commodity exchange transactions of 11 stock exchanges in the Far Eastern Region.

Russian Section of EARN International Network. In 1990, it was decided to put the USSR Academy of Sciences on EARN (European Academic Research Network), uniting more than 500 organizations from 30 nations of Europe, Asia and North America. EARN provides services of data transmission, interactive exchange, access to remote databases, e-mail and teleconferencing. At present, the Zelinskiy Institute of Organic Chemistry is acting as the first node of EARN in Russia. A node at TsEMI [not further identified] of the Russian Academy of Sciences has been put into service. The present plan for setting up the Russian section of EARN calls for connecting users from 92 organizations of the Academy of Sciences with future expansion to several hundred. Nodes are based on YeS computers or super-minicomputers, data teleprocessors, and modems. Dedicated telephone lines are used for organizing internode links. Technical data of the node of the EARN international academic network, which was developed by TsEMI of the Russian Academy of Sciences, are given in [45, 51].

"SOVPAK" Packet Switching Network. Created by Moscow Territorial-Production Association of International and Intercity Communications and the joint Russian-British scientific production association "Marine Computer Systems." The network provides access to a variety of databases, and exchange of business correspondence by the e-mail principle [1]. Network nodes are located in Moscow, St. Petersburg, Kiev and Odessa. The "SOVPAK" network has access to the national network of Sweden. Capacity of switching nodes is 100 packets per second.

Operating organization is SMPP "Marine Computer Systems," tel. (095)925-6783.

Commercial Information Network "ICS-92." The network offers users of the Northwestern Region of Russia up-to-date telecommunications facilities (using channels of "SPRINT" network) and real-time on-line access to information resources [80]. "ICS-92" provides the following services:

- e-mail;
- reception and transmission of telex and fax messages;
- BBS;
- access to system databases, creation of private databases and sharing in the network library with income from sales of information;
- use of electronic department store and real-time participation in trades on the stock exchange and auctions;
- conducting competitions and questionnaires with acquisition of statistical data, and so on.

Operating organization "Informkomset" Joint Stock Company, St. Petersburg, tel. (812)294-8697, (812)294-8597.

"ROMIS" Computer Information Network. The network provides services of e-mail, BBS, remote access to information files containing stock-exchange data, commercial offerings, and normative documents [80]. At the present time, 18 regional centers of the "ROMIS" network are in operation on Russian territory.

Operating organization: "ROMIS-ALFA" Information Center, Moscow, tel. (095)206-8905, fax (095)206-8746.

"CONTACT-NET" Information Network. The "CONTACT-NET" commercial multichannel telecommunications system provides e-mail services, exit to international networks FIDOnet, the Internet, "RELCOM" and Sprintnet with access to the information available there, electronic teleconferencing, electronic bulletin boards, access to subject-area databases; provisions are made for organizing telex communication [80].

The network supports the on-line access mode, confidential message exchange with bilateral coding system (system of "coupled passwords" and direct encryption of message text).

User software is tailored for IBM PC-compatible computers.

Operating organization: joint Russian-German enterprise "KRUBIS" tel. (812)314-2788, fax (812)314-3364.

"STEALTH" Telecommunications Network. The network provides high-speed reliable and confidential transmission of information over telephone channels [80]. Network facilities have been used for two years by commercial banks, stock exchanges, companies and private individuals in Moscow, St. Petersburg, Chelyabinsk, Magnitogorsk, Krasnodar, the Republic of Belarus, and in other regions.

Operating organization: "KOM-STELS" Company, tel./fax (095)254-3295.

Regional-Branch Telecommunications Network. The network is being set up by the "Planning. Economy. Management" Scientific Information Center jointly with "MIR" Cooperative Business Association, the Agency of Wholesale Trade and Information, and "MASTAK" Scientific Production Company [82]. The network provides:

- e-mail, fax and telegraph communication services;
- integration into networks "SITEK," "RELCOM" and some others;
- on-line access to daily BBS postings of commercial offerings;
- priority capability of expeditious conclusion of buying/selling deals for commodities, raw materials, goods and components offered by the Agency of Wholesale Trade;
- support of electronic communication with the Innovational Bank of Credit for Development and Deliveries of Defense (Machine Building) Goods;
- capability of receiving and sending standard telegraph and fax messages directly from the user's personal computer.

Information services provide users with access to databases that contain:

- normative acts of the Russian Federation, Ukraine and Kazakhstan, regulating tax payments, economic sanctions, juridical regulations, processes of privatization, banking relations;
- "Goods and Services" register of CIS enterprises created jointly with Russian-American University;
- daily information from 30-70 stock exchanges (summaries and offerings of commodities for immediate trade and reports on sales from past trades);
- current price lists of leading Moscow suppliers of office equipment, personal computers and peripherals, and non-food commodities;
- analytical surveys of the state of the economy, digests of leading economic periodic publications prepared by the Economic News Agency.

Operating organization: "Planning. Economy. Management" Scientific Information Center. Tel. (095)206-9661, fax (095)928-6852.

"KROSNA" Commercial Information Satellite Communications System (SCS). The system is being developed by Izhevsk Radio Plant and "KROSNA" enterprise [91], and is intended for providing expeditious telephone, telefax and telegraph communications and data transmission between subscribers located on CIS territory, as well as nations of Europe, Asia and Africa based on Russian geostationary satellites.

Subscriber stations are to be produced in three versions:

- stations with capability of simultaneous transmission of information over several channels: telephone (16,000 bauds), intercomputer exchange (9600 bauds), telefax communication (4800 bauds), and telex communication (100 bauds);
- stations with capability of operation over a single intercomputer exchange channel at 28,800 bauds;
- stations with capability of operation over a single telephone channel at 32,000 bauds.

In satellite communication trunk lines, telephone channels are being organized with a speed of 64,000 bauds each. Information transmitted through channels is encrypted.

The "KROSNA" SCS is to be realized in two stages. On the first stage, the SCS will provide communication services on dedicated lines, and each subscriber must have a leased subscriber station. On the second stage, subscribers will be connected to node stations located in regional centers.

The "KROSNA" SCS will provide an outlet to foreign information networks and access to a variety of databases. The system can be used for setting up telecommunications networks of banks, credit-finance institutions, interregional stock exchanges and other enterprises with a broad network of territorial cooperation.

Operating organization: "KROSNA" Association, tel. (095)253-8683, fax (095)253-3930.

Network users are offered the following services [87]:

- exchange of messages between network subscribers,
- access to databases with commercial information;
- electronic bulletin boards;
- on-line electronic trading.

Provisions are made for examining trading offerings and requests, direct observation of changes in these, examination of an archive of offerings, posting notices and advertisements on bulletin boards, real-time presentation of descriptions of goods for sale or various kinds of auctions, acquisition of information of all regional network centers and conducting buying and selling transactions.

"KOMTEK" network has regional centers over the entire territory of the former USSR. The user interacts with the network via personal computer and modem.

Operating organization: "RKTS" Company, tel. (812)301-3222.

CHAPTER 5: Telephone Communications Networks With Elements of Integrated Service

5.1. "ISKRA-2" Dedicated Commercial Network

The service-dedicated digital switchable network (VTsKS) "ISKRA-2" is being set up as a development of the existing "ISKRA" network through complete digitization and increased subscriber capacity [1, 36].

As of now, automatic communication in Russia via the "ISKRA" network covers 50,000 subscribers in 500 cities of the CIS.

The operating organization is the State small business "ASVT."

A distinguishing feature of the network is that users are provided with priority service and higher quality of communications than subscribers of common-carrier OGSTFS due to:

- standardized structure of comm. nication channels and use of only crossbar, quasielectronic and digital components and switching offices;
- limitation of the number of switching nodes and AF repeater sections on the line between any two subscribers, enabling data transmission over the network at a rate of at least 2400 bauds (as high as 9600 bauds on some lines);
- priority servicing of calls from subscribers of the "ISKRA" communication system on long-distance direct dialing (average time of setting up a call is about one minute; for practical purposes, calls are completed with one attempt).

Introduction of the VTsKS may be the first stage in setting up a Unified National Integrated Services Digital Communications Network that , rovides transmission of information in both channel switching and packet switching modes. This network is to be based solely on digital switching and transmission methods, using fiber optics and satellite communication systems, providing the capability of transmitting both speech and nonverbal information between stationary and mobile facilities over the entire territory of Russia.

Considering the experience of repeated unsuccessful attempts to set up a Unified Automated Communications Network in the USSR, and the necessity of considerable volumes of State investments in building a global integrated network, it can be predicted that the VTsKS will be more like a "skeleton" of the future national integrated network to which regional and departmental ISDNs will be connected by coordinated protocols. They will be introduced at an accelerated pace on those sections of the network where there is a sufficiently high level of demands of users for integrated services, the appropriate level of equipment digitization, and interested investors can be found. The first centers of such regions will be Russian cities where state-of-the-art electronic switching systems of leading foreign companies are already being operated, or are planned to be put into service (Moscow, St. Petersburg, Volgograd, Novosibirsk, Tyumen, and so on).

Communications Services. Subscribers of the "ISKRA-2" network are being offered municipal, long-distance and international telephone communications services, fax communications, e-mail and fax-mail.

The network has direct automatic access to international communications using cable and satellite channels.

E-mail facilities provide: storage of incoming messages in the subscriber's mailbox for one month; creating, examining, printing and editing documents; confirmation of message receipt; transmission of information in encrypted form, and so on.

Fax-mail provides expanded service by comparison with conventional message transmission. The user is offered capabilities of:

- circular distribution of messages to hundreds (thousands) of addresses in a time that does not exceed that usually spent on sending a single message;
- use of a voice prompt;
- deferred message transmittal.
- reception of messages addressed to a given addressee;
- reception on the fax terminal of daily reports about the number of transmitted messages, time and duration of transmission;
- receipt for payment sent to terminal.

Fax-mail is accessed from a personal computer with subsequent transmission of text files to any fax machine connected to the system.

Network Topology. On the initial stage of setup, a dedicated digital commercial switchable network (VTsKKS) was put into operation in Moscow, based on the use of digital transmission systems and the AXE-10 electronic dial system. The initial capacity of the VTsKKS in Moscow is 1500 subscribers (expandable to 4000).

Interfacing With Other Networks. For operation with data networks, the VTsKKS commercial network offers users an analog interface and interaction by CCITT protocol X.32. Local packet switching networks are accessed in accordance with X.25 protocol.

Rates. According to data of [36], the following charges are made for services in the "ISKRA-2" network:

a. International telephone communication services (U.S. dollars):

- right of access to international communications $1000.00,
- service charge $350.00/year;
- "ISKRA" installation charge $260.00;
- connect time: Europe-$2.00-$2.50/minute; United States—$4.00-$4.20/minute; Japan—$4.70-$5.00/minute.

Payment for services may be made in rubles at the current exchange rate.

b. E-mail services:

- connection (registration) of subscriber to network 3000 rubles;
- transmission/reception of correspondence beyond the borders of the former USSR 7 rubles/kilobyte;
- transmitting interregional correspondence 1.5 rubles/kilobyte;
- transmitting intraregional correspondence 0.3 ruble/kilobyte.

c. Fax-mail services:

- user registration $30.00;
- monthly service charge $20.00;
- charge for international transmittals: Europe $3.64/minute; United States $5.46/minute; Japan $6.50/minute.

Payment for services may be made in rubles at the current exchange rate.

- charge for intercity transmittals in Russia and the CIS 70 rubles/minute;
- charge for transmittals within Moscow 10 rubles/minute.

Characteristics of Service Quality. Average time of e-mail delivery of information 5 minutes.

Outlook for Network Development. Services are to be added in the form of voice mail and interactive database access.

Characteristics of Information Transmitting Facilities. Network subscribers are connected to terminal offices as a rule by a two-wire circuit. In Moscow, subscribers are connected by a two-wire analog line, using physical circuits or IKM-30 RF channels. Baud rate in Moscow is 9600, and on international lines 2400-4800.

5.2. "KOMBELLGA" Dedicated Digital Network

The "KOMBELLGA" network [11-13] is a dedicated international digital network tailored for providing services in voice and fax communication and electronic data exchange.

Operating organization: "Kombellga" joint Russian-Belgian enterprise.

Founders of "Kombellga" joint enterprise are the "Kominkom" Commercial Company for providing international communications services, and the Belgian companies RTT and Alcatel Bell Telephone.

The digital network includes:

- Alcatel 1000 S 12 international exchange in Moscow;
- Alcatel 4300 L PBX in Moscow;
- satellite communications ground control station in Moscow;
- satellite communications ground control station in Lessive (Belgium);
- Alcatel 1000 S 12 international exchange in Brussels with outlet to nations of America, Europe, Asia, Africa and Australia.

The Alcatel 1000 S 12 international exchange is connected to Alcatel 4300 L PBX's and to the satellite communications station via radio relay lines.

The satellite section of the network uses Intelsat.

Services of the dedicated international network set up and commercially operated by "Kombellga" joint enterprise are used by embassies of the United States, France, Great Britain, Germany, Belgium, Australia and other nations, representatives of international organizations (Europarliament, European Radio Broadcasting Union), large information agencies of industrial and trading companies, and hotels. Network subscribers include the President of Russia, the Chairman of the Supreme Soviet, and the Minister of Foreign Affairs of Russia. Operations of "Kombellga" joint enterprise are not limited solely to Moscow. The company has set up several joint enterprises in Samara, Nakhodka and on Sakhalin, and intends to extend coverage to most regions of the Russian Federation.

At the present time there are 12 PBX's operating in Moscow and Moscow Oblast that are integrated into the "KOMBELLGA" system. At the beginning of 1992, there were 300 network users, and the figure had increased to 2000 by mid year.

"Kombellga" joint enterprise has the goal of providing ISDN level telecommunications services to the class of subscribers in most acute need of them (representatives of the business world, diplomatic and not-for-profit organizations).

The principal hardware facilities of the network are Alcatel 1000 S 12 [92] and 4300 L electronic telephone exchanges.

Alcatel 1000 S 12 electronic telephone exchanges are used on communications networks as terminal, tandem and terminal/tandem municipal telephone network offices, rural and suburban nodes, telephone special services nodes, long-distance dial offices (in the "KOMBELLGA" network such an exchange acts as an international office).

Modular design of hardware and software, and distributed control enable standardized construction of exchanges with different capacities and purposes. Typical equipment configurations are:

- low-capacity dial offices (from 256 to 4000 lines);
- medium-capacity and high-capacity municipal dial offices (as many as 100,000 lines);
- long-distance dial offices with capacity of up to 60,000 lines;
- remote subscriber units with capacity of up to 488 lines.

Basic technical and performance characteristics of the exchange:

- load per subscriber line 0.275 erlang;
- load per connecting line 0.8 erlang;
- overall load 25,000 erlangs;
- number of calls during peak load hours 750,000.

- number of racks in exchange with capacity of 10,000 numbers: 18;
- specific power consumption 1.7 W/number;
- rack dimensions 2100 x 900 x 450 mm;
- installation with or without false floor;
- number of types of supplementary services more than 20;
- type of subscriber lines: two-wire and digital;
- type of connecting lines: PCM sections.

The dial office equipment is designed so that exchanges can be expanded during service in the range from low to ultimate capacity by adding appropriate equipment, expanding switching and software support.

The Alcatel 1000 S 12 is one of the world's most popular switching systems, and is used in more than 40 countries.

The Alcatel 1000 S 12 dial office is to be produced at "Lenbell Telephone" joint enterprise in St. Petersburg [91].

The office is adapted for conditions of use on telephone communications networks of Russia.

The Alcatel 4300 L electronic private branch exchange (PBX) is intended for private use in institutions, hotels, enterprises, and also for setting up various kinds of departmental communications networks.

The facility provides the user with a whole range of the latest services: high-quality and diverse telephone services, transmission (reception) of voice and text messages, data and image transmission services.

Use of international standardized interfaces for making internal and external connections integrates Alcatel 4300 L PBX's and departmental networks based on them into international communication systems, as well as enabling user expansion of the functional capabilities of the PBX for setting up integrated services digital networks.

Basic technical and performance characteristics of the exchange:

- PBX capacity up to 4000 subscriber lines and 400 connecting lines;
- capacity of PBX network up to 32,000 subscriber lines;
- capacity of concentrator up to 100 subscriber lines;
- load per subscriber line 0.15 erlang;
- load per connecting line 0.7 erlang;
- overall load 900 erlangs;
- specific power consumption 1.0-2.5 W/number;
- number of racks in PBX with capacity of 4000 numbers: 3;
- overall dimensions of rack 1950 x 1096 x 580 mm;
- type of subscriber lines: analog two-wire, digital two- and four-wire;
- type of connecting lines: PCM sections, three-wire physical lines.

The exchange supports interfacing with packet switching networks in accordance with X.25 protocol, and with LANs in accordance with IEEE standard 802.

The exchange is adapted for conditions of use on telephone communications networks of Russia.

5.3. "KOMSTAR" Piggyback Digital Network

The "KOMSTAR" piggyback digital network (PDN) has been organized in Moscow and corresponds to European standards with respect to level of communication services offered [14, 29].

The operating organization is Komstar Russian-British Joint Enterprise for Electrical Communications (founders: Moscow Municipal Telephone Service and GPT Limited).

"System X" digital switching systems made by GPT are used for building the PDN. All equipment destined for Russia is adapted to existing telecommunications with the goal of 100-percent compatibility and assurance of high performance indicators.

Thanks to interaction of "System X" with the station of the existing network, all subscribers of the PDN are provided with a direct outlet to the local and intercity networks. The "System X" switching system is connected to a satellite communications ground control station by fiber-optics cable, and subscribers of the PDN are given the capability of accessing the international digital network. The international satellite communications channel is organized by British Telecom, with routing of "KOMSTAR" traffic to all world nations.

The "System X" telephone exchange will be connected to remote computers located at strategic points of the city by a fiber-optics cable ring. This will eventually enable organizations and enterprises in any region of Moscow to become subscribers of the PDN.

Development of the PDN will introduce Moscow to the latest forms of services offered through GPT's ISDX private branch exchanges.

Communications Services. The availability of high-quality digital channels in the communications network gives the capability of offering subscribers a wide range of services: telephone and fax communication, data transmission, videophone, videoconferencing, and access via satellite to more than 200 world nations.

The use of a digital switching system enables realization of the following kinds of additional telephone services in the PDN:

- delivery and connection of pushbutton phones;
- call blocking;
- call waiting;
- alarm and wakeup signals;
- call forwarding;
- speakerphone;
- message register;
- record of surcharges for outgoing calls;
- speed dialing;
- redial;
- direct dialing;
- automatic provision of data on call time and charge.

The piggyback digital network meets ISDN requirements and supports:

- transmission of digital signals and data over conventional telephone lines;
- data transmission in accordance with international standard at 144,000 bauds;
- message transmission at 2 megabauds for private branch exchanges.

Rates. Charges for services offered by "KOMSTAR" PDN are as follows (in U.S. dollars) [29]:

a. Per-minute call rates:

- North and South America $4.25;
- Western and Eastern Europe $2.36;
- Africa, the Middle East $5.00;
- Japan, Asia $3.59;
- Australia $5.75;
- Long-distance calls at rates set by the Ministry of Communications of Russia.

b. Rates for connection to PDN:

- for subscribers to Moscow Telephone Service with line connected to "System X" there is no charge;
- for new business subscriber $1700.00;
- for new residential subscriber $340.00;
- charge for PBX lines depends on type, capacity and location.

c. Yearly rental:

- for each private business line $493.,00;
- for each private residential line $250.00;
- for each PBX line $100.00.

Connection of the first users to "KOMSTAR" PDN began in February 1992 in the south section of Moscow.

5.4. Supplementary Information

Analysis of the situation as it has evolved shows that further development of electronic communication based on analog equipment and specialized networks is ineffective from the standpoint of economy and improvement of the quality of equipment. The ever increasing number of non-telephone terminals (personal computers, telexes, and so on) when using them to serve dedicated networks considerably increases expenditures on the subscriber section of the communications network. Moreover, each dedicated network requires organization of its own operating services.

Analog transmission facilities preclude effectively combining different kinds of communication in a single network, as the parameters of analog signals of different forms of communication are considerably different. As a result, the concept of a universal network has been developed for replacement and merging of all present-day specialized networks. Such a network is termed an integrated services digital network (ISDN).

In accordance with CCITT recommendations, the ISDN is defined as a network:

- that has evolved from a digital telephone network;
- that supports digital transmission of information from subscriber to subscriber;
- that offers subscribers the capability of using different forms and services of electrical communications;
- that uses a limited set of standard multipurpose interfaces for access of subscribers to the network.

The feasibility and advisability of constructing an ISDN based on a digital telephone network is determined by the weight of telephone traffic and by the fact that the 64,000 baud channel used in telephony allows organization of information transmission and other services. With appropriate planning, a major portion of a digital telephone network can be used as an ISDN without any changes.

Three stages can be distinguished in ISDN development.

The first stage consists in development of a digital telephone network from an analog network by gradual introduction of digital transmission and switching methods. This stage is currently being realized in many industrially developed nations.

On the second stage, the digital telephone network is supplemented with the capability of transmitting information from subscribers of other services or specialized networks, using a transmission rate of 64,000 bauds.

On the third stage, services are added with channel throughput of more than 64,000 bauds (radio broadcasting of higher class, videophone, television, and so on).

The foregoing trends in the field of telecommunications require that exchange equipment designed primarily for telephone networks have the capability of operation in an ISDN, realizing the functions of hybrid switching nodes. Satisfaction of this requirement obviates the need for designing a new generation of exchange equipment when converting to integrated networks. Modular decentralized architecture of modern electronic exchanges has enabled successful incorporation of ISDN functions into existing telecommunications networks.

Given below are basic engineering approaches for realizing ISDN functions in Alcatel 1000 S 12 exchanges [28].

Work on implementing ISDN functions in Alcatel exchanges was completed in 1988. The modular architecture of the Alcatel 1000 S 12 combined with distributed control supports incorporation of ISDN functions into existing communications networks by stages.

Some additional modules have been developed for realizing an ISDN: the ISDN subscriber module for lines of 2B+D access; the ISDN packet switching channel module; the remote ISDN unit interface module; the ISDN remote subscriber unit.

The aforementioned ISDN modules in combination with existing modules of the Alcatel 1000 S 12 can handle a mixture of calls set up with both channel and packet

switching, which is required in the ISDN environment, as well as realizing different versions of digital access of subscribers to the exchange. An analogous approach to implementation of ISDN functions is used in Linea UT exchanges.

Linea UT exchanges provide the following additional services: supplemental services of X.25 packet switching network; X.75 interfacing with common-carrier packet switching data network; caller and called ID.

The pace of development of integrated services digital networks is determined by two principal factors: availability of digital transmission systems and capability of wide-scale introduction of the latest electronic exchanges and packet switching equipment in communications networks.

The overall level of digitization of transmission systems in Russia as compared with developed Western nations is woefully low and uneven in different regions. However, there has recently been a noticeable upsurge in the process of digitization with the use of fiber-optics channels and radio relay digital systems due to the advent of goods on the market that have been produced by enterprises of the military-industrial complex in connection with defense conversion.

Electronic exchanges are being introduced in the networks of Russia mainly by using equipment purchased abroad, and the work is limited by the volumes of available cash resources.

It is expected that series production of up-to-date exchange equipment by joint enterprises will begin in 1993-1994.

An overview is given in [53] of the main areas of Russian market activity on the part of Italtel, which is the largest Italian enterprise in the telecommunications field, and the fourth supplier in Europe with respect to volume of goods in this sector. In late 1990, an agreement was signed on setting up the Telezarya Joint Enterprise with participation of Italtel and "Kransaya Zarya" (St. Petersburg) for producing Linea UT digital exchanges with annual production capacity of 1.5 million lines.

The first Linea UT telephone exchange was put into service in Vyborg in late 1991. In 1991, the Astelit Joint Enterprise was created by "Astra" (Russia), Telespazio and Italcabel (Italy), specializing in the sector of satellite telecommunications.

Particulars of Telezarya Joint Enterprise: tel./fax (812)222-8475.

Among electronic exchange projects of Russian enterprises, we might mention the "Beta-P" modern equipment package for industrial digital PBX's and rural dial offices developed by the Scientific Research Institute of Electronic Devices (St. Petersburg) [84]. Series production of the equipment starts in 1993 by plants in Russia and the Republic of Belarus. The equipment is packaged in different capacities from small (180 subscriber lines) to medium (760 subscriber lines). Use of standardized interfaces for setting up internal and external connections enables integration of "Beta-P" exchanges and networks based on them into existing communication systems, as well as future expansion of the capabilities of the equipment for setting up an ISDN. The equipment incorporates hardware and software for implementing base and primary access in accordance with CCITT recommendations (2B+D, 30B+D) supporting connection of digital telephones, multifunctional PC-based terminals, and digital faxes. A modification of the package for operation in an ISDN will be out in 1994.

Contact telephones at Scientific Research Institute of Electronic Devices: tel. (812)245-4305, fax (812)245-3063.

"Teleinform" Business Cooperation Association offers the user the "Sigma" telephone exchange with low and medium capacity for extending telephone service to rural areas and setting up departmental networks [57]. The capacity of the exchanges is from 60 to 2000 numbers. Provisions are made for transmitting voice and data, working as part of integrated services networks. Cost of one number is 6000 rubles (in 1992 prices). Series production is to be started in the first quarter of 1993 by plants of BPO [not further identified] "Progress" (Ufa) and the Electromechanics Plant of "Elektronmash" Scientific Production Association (St. Petersburg). Series production of exchanges with modules of digital subscriber lines and radio attenuation networks will start in the third quarter of 1993.

Contact telephones of "Teleinform" Business Cooperation Association: (812)164-1236, fax (812)164-8512.

CHAPTER 6: Reference Information Systems

6.1. Computer-Aided Commercial Information System

The Computer-Aided Commercial Information System ("ASKI") is designed for organizing real-time exchange of commercial information between enterprises and organizations interested in selling (acquiring) goods and services [43].

Operating organization: All-Union Center of Commercial Information (VTsKI [Vsesoyuznyy tsentr kommercheskoy informatsii]).

Each "ASKI" subscriber must have a personal computer that supports a local user database containing commercial information intended for locating partners and establishing business relations. To transmit information to "ASKI" subscribers, the user creates the appropriate file on his computer, and sends it to the VTsKI computer. Data exchange is by switchable telephone lines via modem. The center delivers received information to all system subscribers over switchable channels. Information received from a subscriber is stored in the VTsKI data bank and used for immediate processing of subscriber queries. If a subscriber's request to acquire goods or services has not encountered a relevant response in the data bank of the center, such a request is immediately

readdressed to all system subscribers (or to those prespecified by the sender of the request).

The system allows for various query options, such as:

- request for sale (acquisition) of specific kinds of material-technical resources under specified conditions;
- request for required services;
- request for offers of services;
- request for loading production capacities;
- request for placing an order;
- request for locating the maker of a specific kind of product, and so on.

Several brokerage offices of the Russian and Moscow commodity exchanges and of the Moscow Nonferrous Metals Exchange are connected to "ASKI."

6.2. Information Services of All-Russian Market Research Institute

The All-Russian Market Research Institute (VNIKI) is a center that offers interested enterprises and organizations under every kind of ownership comprehensive information on questions of foreign economic activity in Russia and the CIS [44].

On a contractual basis, VNIKI offers users:

- data about world prices, market surveys and forecasts of development of markets for various commodities, including the dynamics of prices for a wide range of commodity items;
- information about foreign companies, and also location and expert evaluation of potential foreign partners for import-export deals and setting up joint enterprises;
- documentation on the creation and activity of joint stock companies, small businesses, joint ventures, trading companies, commodity, stock and currency exchanges, free economic zones, and so on;
- materials on questions of legislation.

The "Konyunktura" database has been set up at VNIKI and has been in operation for several years on the principal statistical indicators of evolution of the world market situation. The database contains forecasts of prices on 40 raw materials commodity markets that are most important for Russian foreign trade.

In 1991, the Moscow European Information Center "Euro Info-92" was opened at VNIKI (founders: VNIKI and the State Secretariat of the Belgian Government on European Affairs). The basic purpose of the Center is to help CIS enterprises to locate partners in countries of the European Community (EC), and also to assist in getting partners from Western Europe into CIS markets. The Moscow Center has outlets to "Euro Info" centers in EC nations, to some EC data banks, and also to the European computerized system for locating partners ("business cooperation network").

The information base of VNIKI is kept up by data acquisition from foreign periodic and statistical publications (more than 800 titles), "Reuter's" and AFR international information systems, froand m private correspondents of the world's major business centers (New York, Paris, Tokyo, Bonn, and so on).

6.3. "ELEPHANT" Information System

The "ELEPHANT" information system is a means of automating transactions of large commercial companies or regional agencies of authority [48]. The system provides access to specific offerings for sale, purchase, and locating business partners to a number of subscribers located in various cities of the nation. Operating organization: "Financial Industrial Corporation."

The system's data bank contains continuously updated information about 55,000 enterprises (including defense conversion businesses), more than 60,000 items of goods offered on exchanges and for off-exchange trade, and prices for these goods.

System users are offered the following computer-aided services:

- locating consumers of goods, non-disposable items and equipment, and also customers for placement of new orders and renters of available space;
- location of required material-technical resources, spare parts, equipment, services, available production sites, partners for joint operations;
- advertising subscribers' goods.

The terminal equipment is an IBM-compatible computer and modem. In addition to Hayes-compatible modems, "Menatep," "Mastek" and "Fiztek" modems and compatibles can be used. Subscribers access the system through channels of a switchable telephone network.

The Central Station software of the system supports 24-hour automatic search for counter offers, and intermediary services in concluding agreements for sales contracts.

The universally accepted Harmonized System of Classification is used in identifying items of goods and services.

The "ELEPHANT" system has been introduced at the commercial information center of Euro-Asiatic Financial Industrial Corporation.

6.4. "INTERTES" Information System

The main task of the "INTERTES" international system for informational support of economic trade relations is expeditious dissemination of information about supply and demand for goods and services, setting up market information pools, and organizing exchange of commercial information during transaction of deals [57]. The system was developed by the Russian-U.S. joint venture "INTERTES" and the International Trade and Communication Company (United States).

"INTERTES" is constructed as a distributed data processing system made up of a Central Computer Information Complex and the workstations of final users who subscribe to the System.

From workstations, subscribers access the databases of the System with the capability of search and retrieval of data in accordance with a wide range of criteria, as well as uploading information intended for distribution in the System.

Workstations are connected through switchable telephone channels either to the Central Processing Complex or to a switching machine of the data network. The connection arrangement that is used enables realization of various strategies of System development with allowance for real capabilities of user access to resources of various data networks and the stage of System development.

Data transmission rate in the network is 2400 bauds.

E-mail is being developed within the scope of the System, enabling users to exchange information messages with each other.

User ID and passwords are used in the System to verify authorization of subscribers, protect data, and enable selective distribution of information.

Users are provided with a menu that simplifies access to the System and performance of various operations on data entry, modification, deletion, retrieval and so on for non-programmer subscribers.

6.5. "INFORMSET" Information Services

The "INFORMSET" computer information system offers users services on data exchange, information storage and processing, and access to Russian and foreign data banks [44]. Operating organization: "Inform VES" Association of Informational Support and Automated Data Processing that was founded in 1988 on the basis of two branch computing centers and information structures: MVES SSSR and GKES SSSR.

"INFORMSET" provides the following services in automatic mode:

- offering organizational and procedural assistance to participants of foreign economic operations on CIS territory;
- setting up integrated databases that contain foreign economic information;
- real-time monitoring of observance of State-wide interests by new participants in foreign economic relations;
- access of remote subscribers to computer and information resources, offering services of an electronic data exchange system in "EDIFACT" standards;
- real-time informational interaction between Russian and foreign data banks.

Users interact in the network both through switchable telephone channels and through telegraph network channels.

An integrated network node contains the following databases:

- registration of participants in foreign economic relations;
- licensing of goods and services of participants in foreign economic relations;
- statistical data and information on customs cargo declaration;
- normative reference information;
- business information;
- questions of law in the area of foreign economic operations.

Customer service is in the form of one-time orders, service agreement, and sale and installation of databases on the customer's personal computer.

6.6. "INFO-TASS" Information System

The Telegraph Agency of Commonwealth Nations (TASS) is one of the world's largest information agencies, and has a developed network of regional centers of information gathering and processing in more than 80 cities of the former USSR and the capitals of 120 foreign states [58]. The existing infrastructure of the Agency provides the capability of expeditious acquisition, storage and processing of a variety of information, including commercial information.

At the present time, the "INFO-TASS" database contains currency quotations and gold prices in principal centers of international trade, and data on current prices of major company stocks.

Commercial summaries and other economic data are transmitted by "BIZNES-TASS" videotex service. The materials of this service together with exclusive economic surveys may be printed out.

Interested organizations and individuals are offered real-time information digest service. Customers of this service are provided with three daily editions of a 4-8-page bulletin containing the latest information about events in the nation and in the world (heretofore, digests of this kind were intended only for Politburo members and rulers of the USSR).

6.7. "KOMPASS ROSSIYA" Reference System

One of the world's most highly developed reference systems is the "KOMPASS" Fund of the World Information System of Classification of Commodities and Types of Activity [59, 80]. The system is realized in the form of directories and computer databases that can be used to assist in establishing direct connections between producers and consumers of goods (activities, services).

The "KOMPASS" Fund was instituted in Switzerland in 1948. At the present time, the "KOMPASS" System covers the territory of Russia and other states of the former USSR. Operating organization in Russia: "YUSMOS KOMPASS" Joint Stock Company.

The "KOMPASS" system has information about companies in more than 150 world nations classified in accordance with international standard UCS with respect to

more than 50,000 kinds of goods and services. The database of the System contains information about more than two million companies, firms and other legal entities. "KOMPASS" directories are updated annually.

In addition to conventional address data, "KOMPASS" information also contains facts about goods, year founded, capital, bank, number employed by the company, and so on. The System has sectoral and regional collections (databases).

"KOMPASS" directories will be published in Russian and English. Information will be disseminated through a Russian and International Computer Database.

6.8. Information Services of "International Information and Telecommunications Office"

The "International Information and Telecommunications Office" (MBIT) Joint Stock Company carries out a set of operations in ascertaining, systematizing and evaluating available information resources and disseminating them on a commercial bases [41].

A showroom system is used as the main organizational form of trading in information services, software products and electronic equipment. The system incorporates central, regional and foreign showrooms. System participants operate in accordance with common technology for acquisition, processing and sale of information, enabling the use of a unified product list in all regions covered by the system.

Information about all products and services is contained in the General Data Bank of the system, while demo versions of offered databases are contained in the Unified Computer Library.

Upon concluding an agreement with any of the MBIT showrooms, a vendor automatically commissions all showrooms of the system to represent his interests in the area of advertising and selling his product.

Trading in databases by catalog is now being instituted. Information about a product that contains identification, a sample of a database report and price is included in a catalog that is distributed without charge to potential customers. The first edition of the catalog includes information about 150 databases. The catalog is to be published quarterly in Russian and English, and distributed by subscription.

The switching resources of the "KATYUSHA" network are used to access MBIT information resources. Via this telecommunications network, the information user is offered services of e-mail, BBS, off-line and on-line database access. All system information users are provided with continuously updated electronic catalogs that contain complete information about all system users, a listing and description of available databases, information about services and current prices for system operation.

6.9. "MIR" Commercial-Information System

The "MIR" Commercial-Information System is functionally tailored for information support of market relations [23, 46]. Operating organization: "MIR" [Mezhdunarodnyye intellektualnyye rynki: International Intellectual Markets] ADS [Assotsiatsiya delovogo sotrudnichestva: Cooperative Business Association].

Network resources and switching services of the "MIR" network described in Chapter 4 are used for implementing functions of information exchange and database access.

System databases and information processing software are kept in a Coordination Center (CC) and in Regional Centers (RC). The System implements an information retrieval system of library type with rapid context-sensitive search. Information is accessed on-line via modem over switchable telephone channels.

The main global database of the system maintained by the CC is the "Commercial Offerings" database. Commercial information is transmitted from RCs to the CC daily (average of 70 offerings per day). The incoming information is processed in the CC: classified, indexed, placed in the database, and archived in files for transmittal to RCs. A unified block of new arrivals is distributed back to subscribers daily via a common RC mailbox.

In addition to participation in setting up the system-wide "Commercial Offerings" database, each RC of the Commercial-Information System develops and offers to users its own databases, and also allocates storage space on the host system for accommodating databases of outside organizations.

The Moscow RC of the "MIR" System provides users with access to the following databases:

- catalog of RC BBS users;
- commercial offerings of the Commercial-Information System for the past week;
- commercial offerings of the Commercial-Information system for the past three months;
- digest of advertisement from the press for the past week;
- digest of advertisement from the press (archive);
- databases and informational equipment;
- "Taxes" database;
- commercial offerings from "RELCOM" network;
- database of Republic Information Fund;
- archive of business offerings;
- user directory of the Commercial-Information System;
- train and airline schedule for Moscow, and so on.

The regional center in Nizhniy Novgorod manages the following databases:

- "Russian Commodities and Raw Materials Exchange";
- "News of Stock Exchange, Bank and Economic Activity";
- "Transregional Systems";
- "Laws. Decrees. Resolutions. Rulings of Russia" and so on.

At the present time, the MIR Commercial-Information System maintains 55 different regional databases.

The e-mail facilities of the MIR ADS telecommunications network offer users of the Commercial-Information System service of access to stock exchange information, in particular:

- sending stock exchange information to a subscriber's e-mailbox about commodities being offered for trade from different exchanges, and about specific commodity situations;
- sending information to a subscriber's e-mailbox about enterprises that produce goods of a profile specified by the subscriber;
- presenting the subscriber each day with a table of average prices on CIS exchanges;
- presenting the subscriber each day with lists of deals on 15-20 large CIS exchanges with respect to 15-20 basic commodity groups.

The Commercial-Information System operates on a 24-hour basis.

To be connected to the System, the user must have an IBM-compatible PC and Hayes-compatible modem.

6.10. International Electronic Stock Exchange Information System

The information system is designed for setting up a unified economic user space based on the computer-information infrastructure [60]. The operating organization is the "International Electronic Exchange (MEB: Mezhdunarodnaya Elektronnaya Birzha) of Technologies and Investments."

The System provides for:

- formation of direct ties between enterprises by specialized computer programs (return deliveries, e-mail, broker's automated workstation);
- arranging trading transactions, rapid and reliable generation of foreign trade and customs documents, concluding futures contracts;
- computer-aided processing of exchange information by the international harmonized system;
- rapid access to large volumes of information coming in from all regions of the nation and from abroad;
- integration into the world bank and stock exchange system;
- obtaining data about the world price situation;
- automatic selection of the most profitable options for closing deals.

The system implements transnational databases: investors, know-how, patents, technologies, investment objects, immovable property, securities, enterprises.

Each MEB participant is included in implementation of the program of "Analytical Management of the Economy of Russiaand CIS Nations, and Integration Into the Economy of Nations of the World Community." The program guarantees a rapid rate of turnover and insurance of capital in the system of commercial and exchange banks, clearinghouses, and ensures active development of productive forces of regions.

MEB users are provided with special stock exchange software: broker's automated workstation, international harmonized classifier, electronic newspaper, encryption software, analytical insurance software, transport software, clearing software.

The MEB system operates with "RELCOM," "ISTOK-K" and "INFORMSET"" networks and information systems.

The channels of common carrier networks, the "ISKRA-2" network and satellite channels are used for data transmission.

High-capacity ICL, IBM, VAX and Elbrus computer complexes located in Moscow are used for realizing information processing functions.

The MEB participant (individual or corporate body) must have a personal computer and a telephone line.

6.11. "PATENT" Information System

The "PATENT" Information System for patents and trademarks provides interested users with information about new patents coming into the fund of the Russian Patent Library, and know-how in a variety of fields [57].

On-line services are offered: database retrieval of patents and abstracts, electronic distribution of the full text of descriptions and drawings by preliminary electronic application. Operating organization: "Tekhnokom" Joint Stock Company.

At the present time, system users are being offered access to the following databases:

- abstracts of Russian and foreign inventions;
- new registered trademarks (with graphic);
- full-text patent descriptions "WO" and "EP" (with drawings);
- facts about publications of Russian inventions in bulletins;
- catalog of Soviet inventions;
- catalog of Soviet patent-law literature;
- catalog of scientific-technical literature;
- catalog of patent-associated literature;
- catalogs for funds of descriptions of inventions of the United States, Spain and Australia;
- periodic publications;
- catalog of periodic publications of VTPB [not further identified] funds;
- subject-area patent search;
- business contacts; CIS producers of goods and services.

For connection to the "PATENT" System, the user must have an IBM-compatible PC, MNP-5 modem (2400/1200 bauds) and any communications software.

The system combines on-line and off-line access principles. In the latter case, the user may request data by

application blanks, and during access go to the on-line mode for brief perusal of selected but as yet untransmitted data, and eliminate superfluous information. Work may also be done in the on-line mode with formulation of a large retrieval order, the results being transmitted to the user automatically during nighttime.

The system assigns to each subscriber an individual e-mailbox that contains user logical databases. These store all information (or paths to its access) found in the general system of databases on user requests for retrieval that has not yet been copied to the remote terminal.

The user interacts with the system over channels of a switchable telephone network. Preliminary applications for retrieval can be directed by the user through e-mail (e.g. via "IASNET" addressed to "Telekom" Joint Stock Company).

6.12. "REUTER's" Agency Information Services

The "REUTER's" Agency is a leading world information agency that provides information services via electronic communication channels [44].

"REUTER's" has divisions in 90 world nations, its customers being banks, stock exchanges, transportation companies, and mass media in 160 world nations.

In Russia and the CIS, "REUTER's" customers are large banks, foreign trade institutions, commercial structures, mass media, and also representatives of foreign organizations accredited in Russia and the CIS.

"REUTER's" has 120 customers in the CIS (of which more than 100 are in Moscow).

The purposes of "REUTER's" are:

- to provide financial markets with complete and accurate information in real time;
- to upgrade the "REUTER's" information network with the use of satellite communications and powerful workstations;
- to upgrade software that performs automatic analysis of interest rates for enhancing the capabilities of leaders operating through "REUTER's" channels;
- to offer assistance to leaders in processing and analysis of information obtained through "REUTER's" channels and from other sources.

"REUTER's" provides commercial banking and other organizations with data about rates of exchange on deals and more than 120 currencies. On eight major currencies, data are offered in real time together with prices of gold, silver and interest rates on European and U.S. securities.

Users are provided with real-time information about major commodity markets (quotations, futures and options of nearly 70 commodity exchanges), on raw petroleum and petroleum products (real goods and futures).

A quick and exhaustive survey service is provided on events that influence currency and money markets throughout the world.

6.13. "RIKO" Commercial Information Exchange System

The Regional Informational Commercial Service System ("RIKO": Sistema Regionalnogo Informatsionnogo Kommercheskogo Obsluzhivaniya) quickly locates partners for business transactions [61]. The operating organization is "RIKO" Small Business.

System users are offered capabilities of:

- disseminating their business proposals and advertisements throughout all regions of the former USSR and beyond its borders;
- acquiring similar information from all System subscribers;
- enabling producers and customers to quickly find each other;
- selecting information by various criteria (by classifiers of goods, jobs and services, by national regions, by names of enterprises and organizations, by key words, and so on).

The System posts advertisements and periodic offerings on various kinds of business activity: buying and selling goods, performing jobs and offering services, organizing joint production, leasing equipment, technology, buildings, structures, land parcels, and so on.

Commercial offerings of "RIKO" system subscribers are also disseminated among users of other networks and systems: "PIE-NET," "SOVAM TELEPORT," "MIR" ADS and others.

Users interact with the System over switchable channels of the telephone network.

To be connected to the System, a user must have an IBM PC XT/AT compatible computer and a modem.

The System updates database information on a daily basis.

6.14. "ROSKO" Commercial Information System

The System supports access of users to a commercial database and their participation in operation of a Computer Trading Company [62]. The operating organization is "ROSKO" Joint Stock Company (founders are the Russian Commodities and Raw Materials Exchange, Brokerage Trading Company and "Moscow Municipal Telephone Network" Production Association).

The System database contains information about the computers, peripherals, office equipment, network equipment and consumables in stock at Moscow suppliers, and also about orders for acquisition of these goods.

Information is updated daily. Users can take advantage of services on both a subscription and one-time basis.

The "ROSKO" Computer Trading Company operates in the system. Participants in trades are given the capability of:

- acquiring stock exchange summaries and closing deals on the Russian Commodities and Raw Materials

Exchange, the Moscow Commodities Exchange, and other commodity exchanges without leaving their offices;
- acquiring information about the market status and situation.

The Trading Company operates round the clock. All deals are confirmed by users' personal passwords.

Cost of registration of Trading Company participants is 25,000 rubles. To operate in the system, the user must have a personal computer, modem and telephone.

6.15. "SIRIUS" Commercial Information System

The "SIRIUS" System is built around a distributed database to which user access is provided from personal computers through modems for the purpose of receiving and transmitting marketing information [63]. The operating organization is the Russian Computer Information Center of the RF Ministry of Trade and the "ELM" Company.

System subscribers are offered capabilities of:

- daily acquisition of dozens of commercial offerings pertinent to groups of commodities and regions in which they are interested;
- uploading their own commercial offerings for purchase (sale) to the System's generally accessible database;
- acquiring samples of stock exchange information on groups of goods and services, regions and stock exchanges of interest to them;
- receiving monthly analytical overviews of exchange information;
- having access to continuously updated databases on legislative and normative acts of Russia, and on the addresses of enterprises and organizations.

Advertisements and commercial offerings of subscribers may be posted in the database as widely circulated bulletins, or distributed by list to a specific group of potential customers.

The System provides for use of an "electronic signature" when concluding agreements and sending authorized messages and confidential information. provision is made for interfacing through gateways with international information networks.

6.16. Commercial Information Services in "SITEK" Network

The "SITEK" network offers users a wide range of informational and commercial services: access to subject-area databases and TELEBAZARA, exchange of stock market information [51].

Among the main databases of "SITEK" network are:

- the "Addresses-210,000" database that contains postal addresses of more than 200,000 enterprises and organizations of various regions and industries;
- the database "Stock Exchanges. Who's Who on the Stock Market" that contains information (capital holdings, date established, founders, nominal cost of shares and brokerage seats, addresses, contact telephones and the like) about more than 300 exchanges;
- "Advertising and Press" database, containing data about more than 1000 newspapers and magazines (circulation, cost, ad placement, postal address, telephones);
- "Your Potential Partner" database with information about particulars in the field of activity of leading foreign companies that are ready to cooperate with CIS enterprises and organizations;
- "Real Estate" database with information about the sale of apartments in Moscow;
- "Electronic Publications" database with electronic copies of printed publications (newspapers, books, magazines, references).

The "SITEK" network provides the TELEBAZARA service that gives the user the capability of selling or buying any goods without intermediaries and commissions. TELEBAZARA is accessed by two methods:

1. "SITEK" network subscribers may on their own either post bulletins on TELEBAZARA or look at bulletins at any time of day;

2. Persons wishing to participate in TELEBAZARA that are not "SITEK" subscribers may mail a postcard. Information is posted in the database by the network administration. SITEK users who are interested in the bulletin get into direct touch with the one posting it at the specified telephone number or address.

Information in TELEBAZARA of the "SITEK" network is structured according to the following divisions:

- goods of the agroindustrial complex and the food industry;
- fuel, petroleum, petroleum products, power;
- building materials, glass, construction equipment;
- ores, metals, metal articles;
- computers, electronics, television, radio and office equipment;
- electrical equipment, machine tools, machinery;
- transportation;
- goods of the chemical industry;
- wood, paper, cardboard, furniture;
- textiles, leather, furs, padding, haberdashery;
- pharmaceuticals and medical equipment;
- intellectual property, technology, software;
- real estate;
- miscellaneous goods and services.

Each division is broken down in turn into subdivisions: "sales," "purchases," "exchange," "services."

The "SITEK" user is provided with stock exchange information from more than 20 exchanges: the Russian Commodities and Raw Materials Exchange, the Moscow Commodities Exchange, the "ALISA" Exchange, the Russian Motor Vehicles Exchange and so on. The information

contains summaries of commodity offerings on forthcoming trades, and reports of deals from past auctions. The summaries and reports include the type of goods, cost, conditions and time of delivery, and type of payment.

Information comes directly to "SITEK" from stock exchanges depending on trading periodicity.

At user request, "SITEK" performs a sample analysis of the cost of commodities of interest on several or all exchanges.

The use of stock exchange information enables subscribers of "SITEK" network to evaluate market status, conditions and dynamics, and to profitably buy or sell goods.

6.17. "TELE-MARKET" Information Service System

The "TELE-MARKET" System provides users with modern electronic commercial services for the purpose of locating prospective partners for closing deals and determining the most advantageous projects for financial investments [65].

Participants in the system are offered capabilities of:

- uploading to the system a commercial offering for buying or selling commodities and securities, loans, about services being offered by the given user, or services that he needs;
- acquiring within a few seconds information about counter proposals selected by the system with indication of addresses and particulars of partners;
- acquiring by request information about current prices of supply and demand for competitive goods and services, quotations of securities, cost of credit resources;
- requesting in the system retrospective information for a specified period;
- obtaining information about the dynamics of prices of a commodity or a group of commodities of interest to the user;
- conducting express analysis of bids submitted by the user;
- management of a private database alone at the workstation.

The on-line interactive mode of operation allows system users to track a current event on the market and to submit bids with real-time correction of their content directly from the terminal.

In the central data bank of the system, received bids for supply and demand are automatically compared to locate bids that coincide in requirements, and data are statistically and economically analyzed to provide users with analytical information, forecasts and market services.

6.18. "1S" Reference Information System

The ultimate purpose of the "1S" system is to provide effective access of non-specialist users to databases on individual personal computers and in local area networks, to set up and maintain private information resources [55, 56].

The operating organization is the "1S" Company. This company is the developer and supplier of the "1S" system, provides technical support and information exchange among organizations that own databases, but does not perform any administrative functions.

At the present time, the "1S" system is being used by 240 organizations that own databases in more than 100 cities of the CIS and the Baltics. Each of these organizations serves from less than ten to hundreds of subscribers on the territory of the former USSR, Europe and North America.

Telephone channels (OGSTFS, "ISKRA" network, agency networks) and telegraph channels are used for connecting users to the system.

When operating over telephone channels, modems are used that meet CCITT recommendations V.22, V22bis.

The use of Hayes-compatible modems is preferable. The subscriber has the capability of exchanging files with the host computer (the computer that serves subscriber accesses), as well as exchanging information with other subscribers.

Telegraph channel service facilities enable subscribers of Telex, AT-50, PD-200 and agency networks to be provided with information service by means of software and hardware of the "1S" system without appreciable capital outlays. No special equipment (modems, displays, and so on) is needed for subscribers to work with databases.

The "1S" system enables users to:

- locate information of interest by looking through a subject-area catalog, or providing a sample formulation of the subject area of interest in a natural language (Russian or English, depending on version);
- examine found information on the display screen;
- print out the required data;
- use spreadsheet processors of Lotus type to make calculations, arrange rows and plot graphs.

The cost of the initial software package for organizing a host computer is 32,000 rubles (in October 1992 prices with allowance for VAT) without limitation of the number of subscribers connected to the host computer [56].

The following databases are accessible to users of the "1S" system.

a. "Commercial Offerings" database.

The database contains a variety of information about supply and demand for goods and services. Database subscribers have the capability of acquainting themselves with all commercial offerings published in the press (newspapers "IZVESTIYA," "ROSSIYSKAYA GAZETA," "DELOVOY MIR," "KOMMERSANTU," "EKONOMIKA i NAUKA" and others), as well as with information obtained from database subscribers over communication channels.

The periodicity of updating information is twice a week. Volume of weekly addition to the database—200 offerings.

Cost of subscriber access to database is 5000 rubles per quarter; cost of a copy of the database with updating for "1S" host computer is 15,000 rubles per quarter.

b. "RELCOM Network Commercial Information" database.

The database contains information structured in accordance with the following divisions:

- machine tools, plants, machine building equipment;
- construction materials and equipment;
- metals and metal structural components;
- advertising and bulletins on computer technology;
- foods, alcoholic beverages, tobacco;
- household appliances, everything for the home;
- real estate (houses, apartments, garages);
- transportation;
- consumer goods (clothing, footwear, cosmetics);
- chemical products and fertilizers;
- energy carriers;
- audio and video equipment;
- information service.

Periodicity of updating database: several hundred bulletins per day.

Cost of subscriber access to database is 5000 rubles per quarter, cost of copy of database with updating of information for "1S" hosts is 15,000 rubles per quarter.

c. "CIS Statistics" database.

The database contains annual, quarterly and monthly information on basic socioeconomic indices of CIS nations, as well as about each State of the Commonwealth. In the database are data about CIS imports and exports of consumer goods and technological products, development of new forms of doing business, prices, output of basic kinds of industrial and agricultural goods, and foreign economic relations of Commonwealth States.

The database is generated by the Statistical Committee of the CIS.

Conditions of delivery (as of October 1992):

- 24-hour subscriber access by telephone channel, or one-time delivery of the complete database on magnetic media with information retrieval software for personal computer at a cost of 32,000 rubles;
- delivery of the complete database on diskette with monthly updating for six months at a cost of 48,000 rubles.

d. "Legislation of Russia" database.

There are two versions costing from 23,000 to 45,000 rubles.

6.19. Supplementary Information

The materials given above describe reference information systems that have been most actively advertising their services and goods for the past two years.

However, these do not exhaust the entire listing of systems that determine the "aspect" of the Russian infrastructure. This section gives brief data about some other systems accessible to users on the information services market.

According to data of [42], there are more than 100 nongovernmental information services that operate in the area of commercial information, and that prepare databases with total volume of about 2 million records (mainly relating to enterprises and their goods).

Leading companies in this field are: the "Rezerv" Agency, "RAU-Press," "Aktsept," "Fakt" Joint Stock Company, "Niko-TNK" Joint Stock Company, "Sotsium" All-Russian Scientific Production Association, "Globus," "Delta," "NPF," "Inform," NTK ASU "Impuls," NKITs AST, "Prospekt" Center, "Telekosmos," "ELKOM" and others.

In the sector of economic and demographic statistics, the owner of most databases (about 300) is the State Committee of Statistics and certain commercial structures based on this agency.

In the sector of business news, information systems that are tailored for the Western user have received the greatest development. Most well known in this area are the activities of such companies as "Infolink," "SovEcon," "Pal inform," and the small enterprise "DiZ." "MOSKOVSKIYE NOVOSTI" has the first full-text database with news about events in the CIS. This database is accessible to users in interactive mode via networks of "INFOLINK," "ITAR-TASS," the "Postfactum" Agency, and "ADN."

According to data of [42], databases with legal, foreign trade and economic information have received the greatest development in the special information sector. There are now more than 50 full-text and reference databases on existing economic legislation; some of these are updated on a continuous basis, and are accessible through telecommunications networks. Most active in this field are "Priz" IPIO (22 databases), the "Aktsept" Association, and the "Garant" Company. Full-text databases of procedural information are offered by the "Finvest," "IMBRIS" and "Viking" Companies and others.

"IASNET" and "AKADEMSET" information services. A listing of information sources accessible to users of "IASNET" and "AKADEMSET" networks is given in [17]. More than 20 organizations have set up and are maintaining databases connected to these networks in various fields of science, engineering, economics, on agriculture, athletics and sports, normative documents, software products, patents, companies, the market situation, and so on. Also given there is a listing and brief details of 17 foreign automated data banks that are accessible to users of "IASNET" and that contain about 1400 different databases.

Naval Information System. The Navy's main computing center offers users the services of a system of electronic offices and private information systems [65, 80]. The listing of services offered to users includes the following:

- subject-area databases (juridical, scientific-technical, commercial information, stock exchange information and so on);
- on-line access to databases;
- electronic bulletin boards;
- a system of monitoring access, security and assurance of confidentiality of information;
- outlet to "SPRINT," "INFOTEL," "RELCOM" and Telex networks.

The system simultaneously supports as many as 1000 users working in 10 different languages, including Russian. At the present time, network subscribers are located in Moscow, St. Petersburg, Arkhangelsk, Murmansk, Izhevsk, Ryazan, Khabarovsk, Kiev, Riga, Paris, Frankfurt and other cities.

Radio communications facilities in the VHF and UHF bands are used.

Operating organization: Main Computing Center of the Department of Naval Transportation; tel. (095)248-1960, fax (095)248-1693.

Centralized System of Databases on Scientific and Technical Information. The information system includes all documental databases of VINITI, which contain information from primary sources published in 60 languages in 130 world nations [83]. Users are provided with the following services:

- capability of on-line and off-line operation;
- analog information retrieval in on-line operation from remote user terminals and from the VINITI terminal room;
- transmission of search results via e-mail facilities of the "RELCOM" network;
- off-line search for information in archives, and so on.

Access to information resources is provided by telephone channels.

Operating organization: VINITI, tel. (095)155-4501. VINITI Production-Publication Complex, tel. (095)558-8791.

"KODEKS" Law Information Retrieval System. The system contains more than 300 complete texts of legislative and normative acts of the Russian Federation and St. Petersburg. The database is updated on a daily basis. Also accessible to users is the database "Administrative Institutions of St. Petersburg" [80].

Operating organization: MGP "Center for Computer Projects"; tel. (812)319-9431, fax (812)110-6473.

"THE WALL STREET" Commercial Information System. The system provides the capability of real-time access to information about the operation of more than 100 stock exchanges of the nation, the location of commercial bulletins in "RELCOM" network, acquisition of analytical information about market status, normative acts on Russia and St. Petersburg [80].

Operating organization: ITEK Computer Center, tel. (812)275-8811, fax (812)275-8815.

"BOMEKS" Commercial System. The system provides access to databases that contain extensive information about Russian banks, stock exchanges, enterprises and commodities [80].

The operating organization is the Center for Commercial Computer Networks (BOMEKS International, Ltd.), tel. (812)290-6714, fax (812)290-4107.

Regional Information Center of the Industrial Trade Hall of the Russian Federation. Within the scope of implementation of the concept of a Unified Information System, the Industrial Trade Hall of the Russian Federation is completing the first phase of setting up a regional information system that provides for installing subscriber stations equipped with IBM PC/AT-compatible personal computers with software and modems [86].

Subscriber stations have been installed and put into experimental service in 13 regional industrial trade halls in Moscow, Vladimir, Kaliningrad, Murmansk, Volgograd, Elista, Omsk, Novosibirsk, Ulyanovsk, Voronezh, Lipetsk, Samara and Nizhniy Novogorod.

Connection to the information system of the Industrial Trade Hall will provide regional users with access to the informational databases available in the Hall, covering nearly all aspects of economic activity.

Telephones of the editorial offices of "Vestnik TPP RF": (095)367-9633, 365-4066, 365-2316.

CHAPTER 7: Information Services in Support of Commercial Operations

7.1. Kinds of Electronic Commercial Services

We will include the following among the basic services of a commercial nature that are realized in telecommunications networks:

- electronic trading transactions;
- electronic stock exchange transactions;
- electronic banking transactions.

One of the listed kinds of services or an integrated package of services may be realized in the telecommunications network.

In accordance with the structure of the telecommunications network given in Chapter 1, these electronic operations are done on the applied level of the telecommunications network, using capabilities and services offered on all lower levels of the reference model of interaction of open systems. Therefore, we treat the means of implementing electronic commercial services not as isolated, but rather as an integral part of the telecommunications networks in which they are realized, or may potentially be realized.

The basic kinds of facilities that support services in the area of electronic trading transactions are:

- the electronic mall;

- the electronic market;
- the electronic trading company.

All of the enumerated services are realized on the basis of a BBS, software for database maintenance and management.

Among basic electronic stock exchange operations are broker registration, providing information about goods and services, acceptance and processing of bids for buying, selling, barter, services and the like.

Among electronic banking operations are those involving management of various bank databases (customers, correspondent banks, and so on), customer service, account handling, interbank transactions, credit card transactions, figuring balances, providing a variety of reference and report information, and so on.

7.2. Electronic Stock Exchange Operations in "PIE-NET"

The software system of exchange commodities that is realized in "PIE-NET" is designed for storing information about incoming offerings of various commodities from a variety of companies for any currency, locating offerings in the database that satisfy prescribed criteria, and also providing stock exchange information on request [1].

The system enables suitable partners to be found for closing any deals (buying, selling, barter, services) in the nation and elsewhere, and also contacting them. Advertising of goods is supported. Electronic trades are made by "PIE-NET" e-mail, fully meeting the requirements of the X.400 standard.

The "PIE-NET" stock exchange trading system supports the following kinds of interaction: customer-broker, broker-stock exchange, stock exchange-stock exchange (or interexchange center).

The technology of operation in the network is the same for all types of interactions. One party (Client) places an order for searches, and the other (Executor) carries out the necessary operations to fill this order. The order is formulated as an information application or a bid for closing deals.

The information application specifies acquisition of information about a commodity being offered for sale, or one that is being requested. tentative prices, deals that have been completed, and so on. In the bid for closing deals, the Executor is commissioned to choose the necessary partner for buying/selling or barter of the declared commodity.

Applications are filled out by calling up the required blank to the display screen, entering information in the fields assigned for characteristics of the commodity (product code, price, and so on). The Client may also provide a verbal description of the commodity; in this case, the system determines its characteristics independently from key words.

The system provides a mechanism for conditional and unconditional deals. An unconditional deal is set up by the Executor immediately after locating partners. A conditional deal presumes certain conditions that must be met before the deal can be closed. An example of a conditional deal is the handling of applications that coincide in part. When these are found, the system sends notices to the applicants, indicating the discrepancy in applications. After this, if the Client decides to close the deal, he informs the system about acceptance of the conditions of the partner by dispatching an appropriate message.

"PIE-NET" provides advanced service with regard to diverse forms of bids:

- with transfer of bids that have not been satisfied for a certain time to a higher level of the system (stock exchange or interexchange center);
- compiling a single bid from several identical ones;
- cumulative bid that permits searching for several partner applications;
- "non-expiring" bids (automatically re-entered), i.e. bids that are automatically renewable for a certain period after a deal has been closed.

The system provides several bid processing modes:

- closing a deal based on the first arrival of a coinciding bid;
- with analysis of counter proposals coming within a certain time frame and selection of the most profitable offering;
- without provision of information by the broker about proposals of competitors, and without the capability of correcting one's bids;
- with provision of information to the broker about bids that are not the most profitable for the main bidder, but are of interest to the given broker.

The system operates in both interactive and automatic modes.

The interactive (on-line) method of operation enables Executors without leaving their offices to keep track of current happenings on the exchange (for example the latest quotations for various kinds of goods), and also to take part in trades, responding in real time to a change in the rate on the exchange, submitting bids for commodities, offering and correcting prices for them. The interactive mode enables effective participation in trades without being in attendance at the stock exchange.

The interactive mode is the mode of on-the-spot trading conducted by the speaker of the exchange.

The automatic mode provides automatic summarizing of bids on the Executor's computer, and transfer when necessary to a higher processing level.

The broker or stock exchange assistant sets certain parameters of goods and services, and also the regulating algorithm that completes the deal. Applications are sent to the appropriate Executor, where they are automatically compared to find applications that coincide in requirements.

The automatic and interactive modes are implemented in the system in parallel.

7.3. Commercial Information Services Provided in "LEK TELEKOM" Network and on the Russian Computer Stock Exchange

The "LEK TELEKOM" network provides subscribers with information of the following kinds [2]:

- stock exchange information (daily offerings and summaries of trades on the country's major exchanges, activity of exchange transactions, dynamics of prices and so on);
- banking information (rates for credit, currency exchange rates, and the like);
- juridical information (content of new normative acts and their application in practice);
- commercial information posted on BBS by subscribers of "LEK TELEKOM" and other networks, and obtained by multichannel telephone (bulletins regarding buying, selling, exchange, advertisement, and so on);
- analytical surveys of commercial nature.

The "LEK TELEKOM" Company has developed application-specific software that supports activity of commercial users (the universal "Broker's Automated Workstation" program, and the "Stock Exchange-Broker" software package).

The "Broker's Automated Workstation" program has been developed for improving efficiency of work in the "LEK TELEKOM" network for brokerage offices and companies that use stock exchange information in their operations. The program provides for input, processing, storage and advanced search of both stock exchange information and current operating information of the company. The program may be used for work in other networks and for standalone work.

The "Broker's Automated Workstation" performs the following functions:

- has automatic input of information about trades from exchanges and adjusts itself for any new stock exchange;
- works with commodities identified by using any classifiers or represented by names in free form text;
- searches for information about trades from any number of stock exchanges with the capability of filtering information by stock exchanges, sections, groups of commodities and many other criteria;
- stores and processes information about trades from several stock exchanges simultaneously, information about deals, about bids of clients, and also information about clients of the brokerage firm;
- tracks the status of an order, and monitors executive discipline from information of the broker about clients, bids and deals;
- prepares all necessary documents;
- has built-in context-sensitive help;
- is secured against unauthorized access by personal passwords and data encryption.

The "Stock Exchange-Broker" software package enhances the effectiveness of work of brokerage offices in the "LEK-TELEKOM" network. The software is easily adapted for operation in any other telecommunication networks. It can be used to update databases in the network by periodically generating and transmitting to subscribers short correction files rather than the entire database. The package includes two parts: stock exchange (central) and broker (subscriber).

The Russian Computer Stock Exchange (RKB) has been set up and is in operation based on network and information resources and "LEK TELEKOM" services.

The exchange uses the following kinds of systems and facilities that perform electronic commercial operations [35]:

- an electronic trading system in the distributed "LEK TELEKOM" network;
- the "SPACARD" electronic payment system;
- software packages that support commercial operations.

More than 220 subscribers from 80 cities of the former USSR are now working in the RKB network.

The Russian Computer Stock Exchange performs its operation in close interaction with major stock exchanges, banks, trading companies, and producers of goods and raw materials. The exchange has affiliates in Voronezh, Barnaul, Kaliningrad, Krasnodar, Moscow, Murmansk, Yoshkar-Ola, Novosibirsk, Narva and Tbilisi. Foreign representatives of the RKB are being organized to provide access to the outside market.

The "SPACARD" system of electronic payments introduced by the RKB provides users with a new level of business technology. The system achieves the world's highest level of copy protection, guaranteeing reliability of banking and stock exchange transactions in distributed telecommunications networks.

The Russian Computer Stock Exchange uses in its own operations and offers to users software packages, databases and computer-aided workstations that support comprehensive automation of commercial operations. Given below are the basic performance characteristics of these facilities.

a. Software package "Automated Trading on Electronic Commodity Exchange."

This software is designed for conducting automated trading and exchange of commercial information over computer networks. Running trading and auctioning are supported. The package includes stock exchange software and broker's automated workstation matched in language and message transmission formats. A broker is enabled to submit proposals from any point in the nation for buying, selling, barter, contracts with any conditions, and participating in trades without being in attendance at an exchange. Brokers' clients are assisted in completing profitable deals as a result of price difference on the territory of the nation and abroad.

b. Software package "Automated Financial Resources Market."

This software is designed for computer-aided negotiation of credit resources over computer networks. Running trading and auctioning are supported. The package includes stock exchange software and broker's automated workstation matched in language and message transmission formats. A bank is enabled to submit proposals from any point in the nation on credit with any conditions and to take part in trades without being present in person at an exchange. Brokers' clients are assisted in obtaining advantageous credit.

c. Universal "Broker's Automated Workstation" software package for transactions on any commodity exchanges.

This software is designed for acquisition and analysis of stock exchange information from any exchanges. It is tailored to the formats of exchange summaries. Full-service processing of pertinent information is provided: commodity search, sorting, sampling, information storage, archive compression, file processor, preparation of documents and forms, creating telecommunications software.

d. "Personal Computer Marketing" software package.

This software is designed for real-time acquisition of information about market prices for PCs offered by vending enterprises. PC vendors and salesmen are enabled to advertise their wares at no charge on an unlimited territory. Contains archived information for analyzing and forecasting the dynamics of PC prices.

e. "Commercial Banks" database.

This database is designed for expeditiously acquiring information about commercial banks. Addresses, particulars, facts regarding specialization and capabilities of about 5000 banks can be both uploaded and downloaded. Search for banks is by name, location, and possibilities for various kinds of financial transactions.

f. Database "Brokerage Firms of St. Petersburg."

This database is designed for expeditious acquisition of information about producers, consumers of commodities, and brokerage enterprises. Information about addresses, particulars, specialization and capabilities of enterprises can be both uploaded and downloaded. Search is by enterprises having to do with a prescribed commodity or type of service.

The database supports multilevel informational ties between buyers, sellers, brokers and commodity, provides rapid and effective location of a partner in accordance with prescribed conditions, and has a personal dossier of commercial contacts. Information can be exchanged with partners with automatic updating of the database.

For all the aforementioned systems, the software operates on an IBM PC AT 286/386 under DOS 3.30 or NetWare, and is written in Borland C++. The proprietary DBMS is secure from unauthorized access. The "Broker's Automated Workstation" operates on an IBM PC 286/386, DOS 3.30, and is written in Clipper 4.0. Modem—Hayes 2400 V22bis.

The cost of an account on the network of the RKB Joint Stock Company depends on the volume of services provided and the status of users [35].

1. Status of RKB Network Subscriber, information services, acquisition of list of commodities offered for trading, modem, software, e-mail, "Broker's Automated Workstation," installation, debugging and technical support, software maintenance: "LEK TELEKOM" services—2000-6000 rubles; RKB services—100,000-450,000 rubles.

2. Status of Network Regional Node, information services, acquisition of list of commodities offered for trading, regional computer communications node (10 modems, node and subscriber software, "Broker's Automated Workstation" software, "Central Database of Universal Section" software, software maintenance, installation, debugging and technical support [modems sold separately]): "LEK TELEKOM" services—41,000-45,000 rubles; RKB services—800,000 rubles.

7.4. Electronic Commercial Services in "REMART" Network

The "REMART" network is tailored primarily for realizing a variety of commercial services [85]. The main purpose of introducing the network is to set up telecommunications support for restoring horizontal relations among consumers and producers of goods, provide prerequisites for adequate price formation, accelerate stabilization of the market of goods and services, and introduce systems of electronic billing between banks.

Area of application of network services:

- automated systems for management of banking transactions;
- automated systems for management of stock exchange operations;
- real-time electronic stock exchanges;
- automated systems of real-time electronic billing for savings banks, department stores, and so on.

The network has facilities for setting up electronic stock exchanges, auctions, department stores, trading companies, and conducting interbank transactions.

Network services are used by the Central Bank of Russia, the National Bank of Kazakhstan, and "Central Accounts Hall" Joint Stock Company.

"REMART" network provides real-time information exchange between the Central Bank of Russia and its departments in 81 oblasts of the Russian Federation, and between the National Bank of Kazakhstan and its departments in 19 oblasts.

In the Moscow commercial segment of the network, more than 400 subscribers have been registered in five months

of commercial operation. Among them are 6 major stock exchanges and about 200 brokerage offices.

"Central Accounts Hall" Joint Stock Company supports operation of banking systems in Nizhniy Novgorod, Perm, Belgorod, Petropavlovsk-Kamchatskiy and Kaliningrad, stock exchange systems in Moscow and Chelyabinsk, and common-user commercial segments in Orenburg, Kaliningrad, Irkutsk, Kaluga, St. Petersburg, Krasnoyarsk, Chelyabinsk, Saratov, Gomel, Ufa and Riga. In the introductory stage are banking systems in Yekaterinburg, Barnaul and Smolensk, and regional systems in Tyumen, Kursk, Armavir, Alma-Ata, Karaganda, Ryazan, Sochi, Perm, and other cities.

In the opinion of developers, introduction of the commercial services of "REMART" network should provide:

- effective interaction of stock exchanges, brokerage offices, commercial structures outside of stock exchanges, and industrial enterprises, based on an integrated commercial information medium;
- creation of a distributed marketing system supporting planning and management of the commercial operations of enterprises, companies and their affiliates;
- creation of systems of automation of interbank billing and intrabank operations;
- introduction of electronic customer payment systems.

7.5. Electronic Trading Subsystem of "TEKOS" Network

Since mid 1992, the "Military-Industrial Exchange" (VPB) Joint Stock Company has been conducting regular electronic trading that differs in principle from conventional trading in the capability of closing deals both in VPB and outside of the exchange, 24-hour access to databases, and the capability of communicating with partners at the time most convenient for the user [34]. Taking part in trading in addition to the brokerage offices of the VPB and military-industrial sections of regional stock exchanges, and CIS producer enterprises, are leading brokerage offices of exchanges "Defense Conversion," "Estra," MUVBR [not further identified], Russian Commodities and Raw Materials Exchange and others.

System users are provided with capabilities of:

- confidential high-speed documented "buyer-seller" dialog and concluding deals off the exchange (partner mode);
- participation in ongoing "electronic" competition (tender mode);
- access to daily "electronic" exchange trading in real time (auction mode);
- use of up-to-date telecommunications services (on-line access to various databases, "electronic" bulletin board, interactive exchange of any information with several subscribers, and so on).

As a result of experimental operation of the "TEKOS" network with electronic trading subsystem, it has been proposed that "cross-cutting" trading technology be developed and put into service, including:

- insurance, on-the-spot credit, bookkeeping and freightage support of deals concluded via VPB;
- accelerated introduction of an "electronic signature" State standard;
- commodity and financial clearing;
- automated support of concluded deals.

7.6. "KATYUSHA" Electronic Trading Information System

The system is realized on the applied level of the "KATYUSHA" Telecommunications Network described in Section 4.9.

The "KATYUSHA" system, using telecommunications network capabilities (e-mail communication between users, capability of using economic information banks in real time), realizes not only information support of trading, but also the very process of electronic completion of trading operations, makes the process invariant in time and accessible by telecommunication to a wide range of users in various regions of the CIS [32].

The system is designed for seven groups of users:

- information user;
- trading user;
- collective trading user;
- remote broker;
- collective remote broker (stock exchange);
- central broker;
- central special broker.

a. Information user

The information user may be an intermediary for customers who do not have a user account in the system. In this case, he requests information in accordance with their orders and resells it to his own clientele.

If the information user owns a database, he may conclude an agreement with the system administration and offer his database to all system users in on-line and off-line modes.

b. Trading user

The trading user is a subscriber of one of the regional centers of the system. In addition to the capabilities of the information user, he is provided with capabilities of:

- offering commodities for trade on a unified bill through system brokers;
- purchasing commodities offered on a unit bill for trade through system brokers;
- forming a common-user supply-and-demand database, to which bids for buying and selling are routed;
- independently conducting off-exchange trading operations inside and outside of the common trading space of the system.

The trading user has information about the unified bill that is comprised of the sum of the sales bids uploaded by trading users, remote and central brokers of the system. No

bill for purchasing is formed in the system; purchase bids form a demand database that is accessible to all system users and brokers.

c. Collective trading user

The collective trading user has the same capabilities as the trading user. The difference is that the collective trading user comprises at least 25 individual trading users. The advantage of merging is that it cuts expenses for acquiring a collective user account, as the system gives an 80 percent discount for each user.

d. Remote broker

The remote broker is a subscriber of one of the remote regional centers of the system, and is not personally present on the trading floor, but participates directly in trading, submitting all forms of bids indicated above, and making decisions independently on completion of all buying and selling stock exchange transactions.

The remote broker does not pay commission and brokerage imposts for deals that he makes, and may conclude a commission agreement with his clients to represent their interests in trading.

The remote broker has his own digital signature.

e. Collective remote broker

Typical collective remote brokers are stock exchanges that are part of a second-generation exchange system.

They act as regional nodes of the "KATYUSHA" system, whose users are brokers of these exchanges.

The functional capabilities of the collective remote broker are analogous to those of the remote broker.

f. Central broker

The central broker is situated on the trading floor, and has the following additional capabilities:

- participation in the auction of client bids from trading users of the system;
- direct on-line telecommunications access to system databases, ensuring great reliability and immediacy of communications;
- filling off-line information orders of trading and information users of the system;
- spoken participation and intervention in the process of automatic trading during a session of the stock exchange.

The central broker does not pay an exchange impost from deals that are concluded, and he has his own digital signature.

g. Central "special" broker

The central "special" broker performs at no charge the functions of representative of a regional center on the trading floor, and carries out all necessary operations required by the anti-monopoly committee.

7.7. Example of Electronic Stock Exchange Transactions

Let us take a look at the process of trading on an electronic exchange as exemplified by the International Information and Telecommunications Exchange [30].

Trading is done on the trading floor of the exchange at a set time.

On the trading floor are automated workstations of central and central special brokers of the system, representatives of regional centers, the automated workstation of the main broker of the stock exchange, and the host processing node of the system along with an information display board.

The central posting system, database server, central administrator's automated workstation, subsidiary workstations and telecommunications equipment are located in the service room.

The trading floor is open for operations to central brokers and regional representatives 24 hours a day.

Central, central "special" and remote brokers, participating exchanges, and regional representatives are registered two hours before the start of trading operations, and reception to the host processing node is stopped for sales bids and bids for deals from remote and central brokers.

By this time, the central "special" brokers and regional representatives have retrieved from their mailboxes in the central posting system the incoming messages from clients, and also the formulated trading bill. Thus, the trading bill and messages about bids for deals are duplicated in the host processing node and the automated workstations of the corresponding central brokers.

The host processing node classifies bids coming from users, forms information blocks for trading from the sales bids and bids for deals, and transfers requests for arbitration and other subsidiary messages to the main broker and system administration.

The auction of client bids for selling and buying coming from trading users of the system begins an hour before trading. Participating in the auction are central brokers and regional representatives. Sold bids are transferred to buyers by e-mail after completion of the trading process for subsequent conclusion of commission agreements. If a client's bid is not picked up, it goes to the database of client bids that is duplicated in all regional centers and becomes generally accessible.

Brokers and administrators make efforts to see that trading users send client bids to specific brokers, rather than to the system as a whole.

Participation of remote brokers and exchanges in trading is stopped two hours before trading starts. All bids for deals that are bought in this time are included in the current trading bill, and bids for selling are included in the next trading bill.

Central brokers and regional representatives may also submit bids for deals orally during actual trading.

The beginning of trading is announced aloud by command of the Main Broker of the system and by corresponding keyboarding from the Main Broker's automated workstation to launch the mode of conducting trading on the host processing node.

Operation of the trading algorithm involves step-by-step comparison of a block of incoming bids for sale with the block of bids for deals that arrived from remote and central brokers prior to the start of trading.

The trading process is displayed on the information board. When a deal comes in, the Main broker orally announces the item number, the name of the commodity, and the numbers of the brokers taking part in the deal.

If a deal is concluded between central brokers, they verify information from the board against information on their automated workstations and orally confirm the deal.

If the deal has been made automatically between remote brokers, the deal is confirmed by representatives of the corresponding regional centers or by central "special" brokers of the system after comparing information against their automated workstations.

If the deal is mixed, oral confirmation is made by the corresponding parties: central and central "special" brokers or representatives of regional centers.

During trading, an auction situation may arise. If the auction situation has arisen during automatic realization of the trading algorithm, it is resolved in accordance with a prescribed algorithm established in the Regulations for Conducting Exchange Sessions.

In this case, central brokers and regional representatives on the trading floor may participate orally in the auction and win it.

An auction situation may also arise among brokers directly in attendance on the trading floor, rather than during automatic realization of the trading algorithm. In this case, the auction is conducted in standard fashion.

From the keyboard of his automated workstation, the Main Broker registers deals concluded on the part of central brokers, and deals concluded automatically by the system during realization of the trading algorithm by the host processing node and orally confirmed by central and central "special" brokers or by representatives of regional centers.

After completion of trading, the host processing node generates notices of results of trading by specific commodity items and routes them to the brokers taking part in corresponding deals. General trading results are routed to a database of trading results that is generally accessible to all system users.

The host processing node also generates a new bill for the next trading session, including bids for sale that have arrived during trading, and excluding sold or expired items. The bill is routed to regional centers for transmission to remote brokers and trading users.

7.8. Supplementary Information

Data are given in [6] about proposed introduction of stock exchange information systems in the Russian Commodities and Raw Materials Exchange and Moscow Commodities Exchange.

In particular, the Russian Commodities and Raw Materials Exchange intends to set up a system that merges the information resources of this exchange, "RINAKO" Joint Stock Company, RFB and RNKB based on resources of "RELCOM" telecommunications network. Through investments allocated for realization of this project, it is proposed that the functional capabilities of "RELCOM" network be expanded by an increment in the information resources and implementation of real-time exchange. Creation of a new infrastructure will enable "RINAKO" to expand the network of its regional representatives and affiliates.

In order to set up an applied information system, the Moscow Commodities Exchange intends to use the facilities of "REMART" network developed by the "Russian Commercial Initiative" Joint Stock Company. The system operates in real time, and allows creation of a unified information space for all regional stock exchanges, and electronic trading.

Table 8.5. Topology of Networks

ARGONAUT	Network nodes are to be located in the following cities: a. Central Region. Center of first level: Moscow. Centers of second level: Vladimir, Ivanovo, Kaluga, Ryazan, Smolensk, Tver, Tula, Yaroslavl. b. Northwest Region. Center of first level: St. Petersburg. Centers of second level: Arkhangelsk, Vologda, Kaliningrad, Petrozavodsk, Syktyvkar, Murmansk, Novgorod, Pskov. c. Central Black-Earth Region. Center of first level: Voronezh. Centers of second level: Belgorod, Bryansk, Kursk, Lipetsk, Orel, Tambov. d. Volgo-Vyatsk Region. Center of first level: Nizhniy Novgorod. Centers of second level: Kostroma, Yoshkar-Ola, Saransk, Cheboksary, Vyatka. e. Podvolzhsk Region. Center of first level: Samar. Centers of second level: Astrakhan, Volgograd, Elista, Penza, Saratov, Kazan, Simbirsk. f. Northern Caucasus Region. Center of first level: Rostov-na-Donu. Centers of second level: Makhachkala, Nalchik, Krasnodar, Vladikavkaz, Stavropol, Groznyy. g. Ural Region. Center of first level: Yekaterinburg. Centers of second level: Orenburg, Chelyabinsk, Perm, Izhevsk, Kurgan, Ufa. h. West Siberian Region. Center of first level: Novosibirsk. Centers of second level: Barnaul, Kemerevo, Omsk, Tomsk, Tyumen. i. East Siberian Region. Center of first level: Irkutsk. Centers of second level: Ulan-Ude, Krasnoyarsk, Kyzyl, Chita. j. Far Eastern Region. Center of first level: Khabarovsk. Centers of second level: Blagoveshchensk, Petropavlovsk-Kamchatskiy, Magadan, Vladivostok, Yuzhno-Sakhalinsk, Yakutsk.
AT-50	All regions of Russia and CIS nations.
BIZ LINK	All regions with automatic connection to Moscow.
GLASNET	"GLASNET" e-mail is accessed by direct dialing in: Moscow, St. Petersburg, Vladivostok, Murmansk, Odessa, Riga.
DV-NET	Nodes in Khabarovsk, Vladivostok, Petropavlovsk-Kamchatskiy. Communication with Moscow is planned.
EARN	Plans call for including in the network users from 92 organizations of the Academy of Sciences in all regions of Russia (with expansion to several hundred).
IASNET	Network nodes are located in Novosibirsk, Dushanbe, Rostov, Tbilisi, Yerevan, Odessa, Obninsk. As of May 1990, the infrastructure of VNIIPAS extended to the following cities: a. In Russia: Moscow, St. Petersburg, Tver, Dubna, Yaroslavl, Obninsk, Pereyaslavl-Zalesskiy, Rostov, Perm, Izhevsk, Yekaterinburg, Novosibirsk, Apatity, Murmansk, Khabarovsk, Magadan, Balgoveshchensk, Vladivostok; b. In other nations of the former USSR: Minsk, Kishinev, Kiev, Odessa, Batumi, Tbilisy, Yerevan, Baku, Dushanbe, Tashkent, Alma-Ata, Riga, Vilnyus, Tallinn, Tartu; c. In other nations: Helsinki, Berlin, Warsaw, Prague, Vienna, Budapest, Sofia, Hanoi, Ulan-Bator, Pyongyang, Havana.
INTERLINK	Ten nodes in Russia, Germany, Switzerland and Luxembourg.
INFONET	All regions of Russia and CIS nations.
INFOTEL	Deployment of the "INFOTEL" network is to be done by stages: Stage 1 (second quarter of 1992). Operational introduction of "INFOTEL" network in Moscow: installation of one HNN/HMS and for HNN 20. Connection to "DATEX-P" network (Germany) via satellite channel in June-July 1992. Stage 2 (1992). Extension of the network to: St. Petersburg, Kaliningrad, Khabarovsk, Yekaterinburg, Nizhniy Novogorod, Samara, Kazan, Rostov-na-Donu, Novosibirsk, Tyumen, Vladivostok, Riga, Murmansk, Minsk, Alma-Ata. Stage 3 (1993-1995). Extension of the network to: Petrozavodsk, Novgorod, Volgograd, Astrakhan, Krasnodar, Irkutsk, Yuzhno-Sakhalinsk, Omsk, Tomsk, Kemerovo, Chita, Yakutsk, Petropavlovsk-Kamchatskiy, Novokuznetsk, Arkhangelsk, Norilsk, Krasnoyarsk, Donetsk, Saratov, Orenburg, Cherepovets, Sochi, Tolyatti, Barnaul, Pskov.
ISKRA-2	VTsKKS "ISKRA-2"), Moscow. "ISKRA": all regions of Russia, CIS nations (more than 500 cities).
ISTOK	At the present time, switching centers and concentrators of the network are located in Moscow, St. Petersburg, Krasnodar, Vladimir, Arkhangelsk, Irkutsk, Severomorsk, Tambov, Voronezh, Minsk, Dushanbe, Tashkent.
ICS-92	Northwestern regions of Russia.

Table 8.5. Topology of Networks (Continued)

KATYUSHA	On the first stage, regional centers are to be set up in: Volgograd, Kazan, Samara, St. Petersburg, Moscow, Nizhniy Novgorod, Novosibirsk, Omsk, Perm, Rostov-na-Donu, Yekaterinburg, Ufa, Chelyabinsk, Alma-Ata, Baku, Dnepropetrovsk, Donetsk, Yerevan, Kiev, Minsk, Odessa, Tashkent, Tbilisi, Kharkov. On the second stage, network topology will be expanded by introducing regional centers in: Arkhangelsk, Astrakhan, Barnaul, Bryansk, Vladivostok, Voronezh, Vladimir, Groznyy, Izhevsk, Irkutsk, Kaliningrad, Kemerovo, Kirov, Krasnodar, Krasnoyarsk, Kursk, Lipetsk, Magnitogorsk, Murmnask, Naberezhnyye chelny, Nizhniy Tagil, Novokuznetsk, Orel, Orenburg, Penza, Ryazan, Saratov, Sochi, Tver, Tolyatti, Tomsk, Tula, Tyumen, Ulyanovsk, Khabarovsk, Ashkhabad, Vilnyus, Gomel, Dushanbe, Zaporozhye, Karaganda, Kishinev, Krivoy rog, Lugank, Lvov, Makeyevka, Nariupol, Nikolayev, Riga, Tallinn, Frunze, Chimkent.
KOMBELLGA	Moscow, Moscow Oblast.
KOMSTAR	Moscow.
KOMTEK	Regional centers over the entire territory of the former USSR.
LEK TELEKOM	"LEK TELEKOM" network includes more than ten regional nodes and several hundred subscriber stations situated over the entire territory of the former USSR in more than a hundred cities. New nodes are instituted as the network expands, and a certain number of subscribers appear in a specific region. The central node of the network is located in St. Petersburg.
MIR	Regional centers of the network are located in: Alma-Ata, Barnaul, Bratsk, Brest, Bryansk, Buzuluk, Bishkek, Volgodonsk, Dnepropetrovsk, Donetsk, Dushanbe, Yekaterinburg, Irkutsk, Kazan, Kaliningrad, Kiev, Kishinev, Korosten, Krasnodar, Kustanay, Komsomolsk-na-Amure, Lipetsk, Lugansk, Magnitogorsk, Makhachkala, Minsk, Millerovo, Moscow, Moscow Oblast, Nizhniy Novgorod, Nikolayev, Novosibirsk, Odessa, Orenburg, Perm, Petrozavodsk, St. Petersburg, Saratov, Sosnovoborsk, Tomsk, Tynda, Tyumen, Ulyansk, Usinsk, Ufa, Khabarovsk, Khodzheyli, Cheboksary, Chelyabinsk, Cherpovets, Cherkassy, Chita.
OGSTFS	All regions of Russia. CIS nations.
PIE-NET	At the present time, regional centers of "PIE-NET" are operating in Moscow (4 centers), Yekaterinburg, Tbilisi, Donetsk, Tallinn, Minsk, Gorno-Altaysk. In future, post offices will be set up in Khabarovsk, Rostov, St. Petersburg.
RELCOM	The network serves more than 15,000 subscribers located in more than 250 cities of the CIS.
REMART	Switching centers and concentrators in Moscow, St. Petersburg, Saratov, Chelyabinsk, Orenburg, Orel, Irkutsk, Krasnoyarsk, Kenigsberg, Ufa, Gomel.
ROSPAK	At the present time, an experimental section of the network has been set up and put into trial operation that includes the following cities of Russia: Moscow, St. Petersburg, Samar, Chelyabinsk, Rostov-na-Donu, Nizhniy Novgorod, Vyatka, Yekaterinburg, Kazan, Khabarovsk. In 1992, the network will cover as many as 35 cities, in 1993 up to 100, and in 1994 as many as 150 cities of Russia. Within the scope of the experimental section, users are being offered channel, packet and adaptive switching data transmission services, e-mail, file transfer, database access and a network reference information service.
SEDAB	All regions that have dial service to Moscow.
SITEK	Abakan, Azov, Aldan, Aktyubinsk, Aleksandrov, Alma-Ata, Almalyk, Andyr, Angarsk, Amavir, Arsenyev, Arkhangelsk, Astrakhan, Ashgabad, Baku, Balashikha, Balta, Belgorod, Berdsk, Bolshevo, Borzhomi, Borisoglebsk, Bryansk, Velikiye Luki, Vilnyus, Vladivostok, Vladikavkaz, Vladimir, Volgograd, Volzhsk, Vologda, Voronezh, Voskresensk, Vyksa, Vyazma, Glazov, Gorlovka, Grodno, Dzhambul, Dzerzhinsk, Dzerzhinskiy, Dnepropetrovsk, Donetsk, Dushanbe, Yevpatoriya, Yeysk, Yekaterinburg, Yelets, Yerevan, Zhukovskiy, Zagorsk, Zaporozhye, Zarechnyy, Zelenodolsk, Ivanovo, Ivanterevka, Izhevsk, Irkutsk, Yoshkar-Ola, Kazan, Kaliningrad, Kalinovo, Kaluga, Kartaly, Kashira, Kemerovo, Kerch, Kirov, Kislovodsk, Kishinev, Klin, Kolomna, Kolpashevo, Kostroma, Kramatorsk, Krasnodar, Krasnoturinsk, Krasnoyarsk, Kupyansk, Kurgan, Kutansi, Kyzyl, Leninsk-Kuznetskiy, Liyepaya, Lyubertsy, Magnitogorsk, Maykop, Makeyevka, Mariupol, Minsk, Moscow, Mukachevo, Murmansk, Mtsensk, Mytishchi, Nadym, Nalchik, Narva, Naro-Fominsk, Nakhodka, Nizhniy Novgorod, Nikolayev, Novyy Urengoy, Novokuznetsk, Novorossiysk, Novosibirsk, Norilsk, Noyabrsk, Obninsk, Odessa, Omsk, Orel, Orenburg, Pavlovsk, Panevezhis, Penza, Pervouralsk, Perm, Petrozavodsk, Pechora, Poltava, Pyarnu, Ramenskoye, Reutov, Riga, Rostov-na-Donu, Rudnyy, Ryazan, Samar, St. Petersburg, Saransk, Saratov, Sevastopol, Severobaykalsk, Semipalatinsk, Sergiyev Posad, Smolensk, Sosnovoborsk, Sofiya, Sredneuralsk, Stavropol, Syktyvkar, Tallinn, Tambov, Tartu, Tashauz, Tashkent, Tbilisi, Tver, Tobolsk, Tolyatti, Tomsk, Troitsk, Tula, Tyumen, Ulan-Ude, Ulyanovsk, Usinsk, Ust-Ilimsk, Ust-Labinsk, Ufa, Ukhta, Khaapsalu, Khartsyzsk, Kharkov, Tselinograd, Cheboksary, Chelyabinsk, Cherepovets, Chimkent, Shadrinsk, Shakhty, Shchelkovo, Elektrostal, Yuzhno-Sakhalinsk, Yurga, Yakutsk, Yaroslavl.
SOVAM TELEPORT	Regional teleports of the network are located in Moscow and St. Petersburg.
SOVPAK	Network nodes are located in Moscow, St. Petersburg, Kiev and Odessa.
SPRINT NETWORK	Packet switching nodes are located in Moscow, St. Petersburg, Khabarovsk, Samara, Perm, Novosibirsk, Yekaterinburg, Tomsk, Chelyabinsk, Petrozavodsk, Nakhodka, Kiev, Odessa, Riga.
TEKOS	In September 1991, An experimental section of the "TEKOS" system was put into trial service, including a packet switching and network control center (Kaliningrad, Moscow Oblast) and subscriber stations in 12 cities. In 1992, the infrastructure of the network was extended to the following territories: cities of Russia—Moscow, Kaliningrad (Moscow Oblast), Sergiyev Posad, Obninsk, St. Petersburg, Kaliningrad, Kursk, Taganrog, Rostov, Krasnodar, Sochi, Saratov, Samara, Nizhnekamsk, Izhevsk, Perm, Yekaterinburg, Nizhnevaratovsk, Omsk, Novosibirsk, Krasnoyarsk, Ulan-Ude; cities of the CIS—Kiev, Alma-Ata, Bishkek; cities of neighboring countries—Tallinn, Riga, Vilnyus.

Table 8.6. Provisions for Network Information Security

Name of Network	Software Methods and Means
ARGONAUT	Data encryption, protection during storage in databases and during transmission. Protection from unauthorized access to information. Electronic signature. Subscriber ID and authorization.
INFOTEL	User ID. Closed subscriber groups.
ISTOK-K	Subscriber ID (right of entry to network). Verification of user rights. Closed subscriber groups.
KATYUSHA	Digital signature.
LEK TELEKOM	Message encryption on subscriber level by network or personal key.
PIE-NET	Prevention of unauthorized access by passwords in modems and dial-back reverification of subscribers. Digital signature based on RSA algorithm.
SITEK	Data encryption. Electronic signature.
CONTACT-NET	Message text encryption. Password system.
SET BLITS	Passwords. Encryption. Electronic signature.
TEKOS	Cryptographic protection of information by the principle of subscriber classification, monitoring message authenticity and integrity, digital signature, database encryption, limited access to resources.

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, military, economic, environmental, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available sources. It should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated; those from English-language sources are transcribed. Except for excluding certain diacritics, FBIS renders personal names and place-names in accordance with the romanization systems approved for U.S. Government publications by the U.S. Board of Geographic Names.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names rendered phonetically are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source. Passages in boldface or italics are as published.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in eight volumes: China, East Europe, Central Eurasia, East Asia, Near East & South Asia, Sub-Saharan Africa, Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications, which include approximately 50 regional, worldwide, and topical reports, generally contain less time-sensitive information and are published periodically.

Current DAILY REPORTs and JPRS publications are listed in *Government Reports Announcements* issued semimonthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. New subscribers should expect a 30-day delay in receipt of the first issue.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcover or microfiche) at no charge through their sponsoring organizations. For additional information or assistance, call FBIS, (202) 338-6735,or write to P.O. Box 2604, Washington, D.C. 20013. Department of Defense consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.)

Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.

END OF FICHE

DATE FILMED

20 Oct 94